Rec'd: 3/28/14

STATEMENT OF TECHNICAL REVIEW

Remedial Investigation/Feasibility Study Activities for Operable Unit 2 (Vapor Intrusion Pathway) at the St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

January 2014 Vapor Intrusion Assessment at Private Property 3, St. Louis, Missouri

The CH2M HILL team has completed the technical review of the submittal described above. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project, as defined in the Quality Control Plan. During the independent technical review, compliance with established policy principles and procedures, using justified and valid assumptions, was verified, including review of assumptions; methods, procedures, and material used in analyses; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with the law and existing U.S. Army Corps of Engineers policy.

Technical Reviewer	Signature	Date of Review
Susanne Borchert	S. Borchert	03/19/14
Loren Lund	Loren Lund	03/19/2014

Quality Control System Manager or Project Manager	Independent Technical Review Leader
Anthony Swierczek	Susanne Borchert
Signature: Anthony Swierczek	Signature: S. Borchert
Date: 03/21/2014	

The following Attachments are available only on CD

Attachment 1

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3.0

0001

DEPARTMENT OF THE ARMY
HEADQUARTERS, 88TH REGIONAL SUPPORT COMMAND
60 SOUTH O STREET
FORT MCCOY, WISCONSIN 54656

REPLY TO
ATTENTION OF

March 24, 2014

Directorate of Public Works

[redacted]

We wanted to take this opportunity to thank you for your assistance in allowing us to collect samples at your home and update you on our ongoing investigation into potential contamination for the former Hanley Area of the St. Louis Ordnance Plant. It is our intent to keep you informed as we continue our work to determine the extent of any environmental impacts related to that facility.

As you know, in January 2014, a contractor for the 88th Regional Support Command (RSC) collected environmental samples at your residence. We are enclosing a report summarizing the sampling effort for your information. It also compares January 2014 results with those from sampling performed in February 2012 to analyze if and how the chemical concentrations are changing over time.

The sampling was completed to assess whether contamination is affecting local residents' indoor air quality through a process called vapor intrusion. Vapor intrusion occurs when vapors from volatile chemicals in groundwater or subsurface soil move through the soil and enter nearby buildings.

Samples of indoor and outdoor air, along with soil vapors from beneath the basement floor slab were collected from your residence to assess whether vapor intrusion may be of concern. Samples were analyzed for chemicals known as volatile organic compounds (VOCs). Those are the contaminants from the former Hanley Area that could potentially result in vapor intrusion.

VOC concentrations detected in the samples were compared to levels developed using U.S. Environmental Protection Agency (EPA) methods. EPA has determined that these levels are protective of individuals who may be exposed to these chemicals through inhalation. Screening levels are very conservative and are usually several times lower than the final permissible levels.

Based on sampling performed in January 2014, contamination from the former Hanley Area does not appear to be contributing to vapor intrusion at your residence. This conclusion is based on the following observations:

- Most indoor air samples that had detections of VOCs above risk-based levels appear to be related to indoor or outdoor chemical sources. Indoor air concentrations measured in 2014 generally were comparable to those measured in February 2012 and for many of the chemicals, background chemical sources such as household products or outdoor chemical releases such as automobile exhaust are responsible for the indoor air concentrations that exceeded screening levels.

- Chloroform exceeded the risk-based screening level in subslab soil gas. For this chemical, vapor intrusion does not appear to be the source because the concentration was higher in the indoor air sample than the subslab sample, suggesting an indoor chemical source. This chemical was also detected at a similar level in subslab soil gas in February 2012. Chloroform is a common background VOC in municipally treated water and household products.

- Naphthalene exceeded the risk-based screening level in subslab soil gas. Although the potential for subsurface contributions of the chemical naphthalene to the indoor air cannot be ruled out since the subslab concentration exceeded the indoor air level by less than one order of magnitude, the lack of shallow groundwater detections at MW-108S, MW-109S, and MW-123S suggest the former Hanley Area is not likely the source.

The information collected to date suggests that the vapor intrusion pathway is not of concern at the residence, because site-related VOCs do not appear to be accumulating beneath the basement floor slab at levels that pose concerns for indoor air quality.

Although the February 2012 and January 2014 results indicate that vapor intrusion is not a concern at the residence, the 88th RSC would like to collect two more rounds of indoor air, outdoor air, and subslab soil gas samples to further assess the vapor intrusion pathway and determine whether subslab soil gas concentrations are changing over time. If you grant us permission to perform the follow-on work, we will provide a report on the sampling results for your review.

The Army will also keep you informed of the vapor intrusion investigation being conducted at the former Hanley Area and along Stratford Avenue. Results from that investigation, along with the sampling the Army wishes to perform in your residence, will help the Army determine if there is a link between the former Hanley Area and chemical concentrations at the residence, should future sampling find VOC concentrations exceeding screening levels in indoor air or subslab soil gas. If a connection is found, the Army will take appropriate corrective measures to address the vapor intrusion pathway, at no cost to you.

We appreciate your cooperation and patience through the sampling process. We will contact you by phone in the coming days to ask for your permission to perform the follow-on work and answer questions you may have about that work or the information provided in the enclosed report. In the meantime, if you have any questions, please feel free to call contact Mr. Barry McFarland at (316) 681-1759, extension 1419, or Ms. Josephine Newton-Lund at (816) 389-3912, or by email at barry.l.mcfarland2.ctr@mail.mil or Josephine.M.Newton-lund@usace.army.mil.

Sincerely,

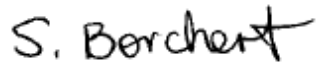
For David L. Moore
Chief, Public Works- Environmental Division

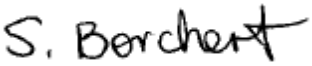
STATEMENT OF TECHNICAL REVIEW

Remedial Investigation/Feasibility Study Activities for Operable Unit 2 (Vapor Intrusion Pathway) at the St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

January 2014 Vapor Intrusion Assessment at Private Property 3, St. Louis, Missouri

The CH2M HILL team has completed the technical review of the submittal described above. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project, as defined in the Quality Control Plan. During the independent technical review, compliance with established policy principles and procedures, using justified and valid assumptions, was verified, including review of assumptions; methods, procedures, and material used in analyses; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with the law and existing U.S. Army Corps of Engineers policy.

Technical Reviewer	Signature	Date of Review
Susanne Borchert		03/19/14
Loren Lund		03/19/2014

Quality Control System Manager or Project Manager		Independent Technical Review Leader
Anthony Swierczek		Susanne Borchert
Signature	Date	Signature
	03/21/2014	

January 2014 Vapor Intrusion Assessment at Private Property 3, St. Louis, Missouri

PREPARED FOR: U.S. Army Corps of Engineers–Kansas City District

PREPARED BY: CH2M HILL

DATE: March 24, 2014

This memorandum presents the objectives, methods, and findings of the follow-on vapor intrusion (VI) assessment performed at Private Property 3 (PP-3) in St. Louis on January 13 and 14, 2014. The assessment consisted of groundwater sampling between December 16 and 19, 2013 and subslab soil gas, indoor air, and ambient (outdoor) air sampling between January 13 and 14, 2014 in accordance with the *Final Uniform Federal Policy—Quality Assurance Project Plan, RI/FS Activities for Operable Unit 2 (Vapor Intrusion Pathway), St. Louis Ordnance Plant, Former Hanley Area, St. Louis Missouri* (referred to herein as Operable Unit 2 [OU-2] RI work plan; CH2M HILL 2013).

The work described in this memorandum was the first round of VI assessments performed under the OU-2 RI work plan at PP-3. One previous VI assessment that took place in February 2012 is discussed in the following technical memorandum:

- *February 2012 Vapor Intrusion Assessment at Private Property 3, St. Louis, Missouri* (CH2M HILL 2012).

The work was performed as part of the Defense Environmental Restoration Program under Contract Number W912DQ-11-D-3005, Task Order Number 0009.

1. Introduction

The U.S. Army selected a preferred alternative for addressing contamination at the St. Louis Ordnance Plant, former Hanley Area (Figure 1), in consultation with the Missouri Department of Natural Resources (MDNR) and U.S. Environmental Protection Agency (USEPA), Region 7, and with input from the public. The preferred alternative was presented in a proposed plan (CH2M HILL 2010a) submitted for public comment in November 2010.

The project stakeholders agreed to divide the former Hanley Area into two OUs during development of the decision document:

- OU-1: Actions Addressing Contaminated Soil, Powder Well Sediment, and Groundwater Concerns
- OU-2: Actions Addressing the VI Pathway

The decision document for OU-1 was finalized, signed by the Army Environmental Command, and endorsed by MDNR and USEPA in September 2011 (CH2M HILL 2011). The U.S. Army performed a remedial action at OU-1 in 2012 that consisted of onsite groundwater treatment and offsite disposal of excavated soil and powder well sediment to address potential human health risks identified in the remedial investigation (RI) report (CH2M HILL 2009b). Several VI assessments were performed during the OU-1 remedial action at various residences north of Stratford Avenue based on volatile organic compound (VOC) concentrations in groundwater, the proximity to the former Hanley Area, and previous VI assessment findings at adjacent properties. Figure 2 shows the August 2010 VOC concentrations in groundwater that exceeded screening levels (e.g., drinking water standards or risk-based standards for potable water use) and prompted the VI assessments. The lines of evidence from these VI assessments indicated there is no conclusive link between the former Hanley Area groundwater contaminants and vapor intrusion into indoor air.

However, additional VI pathway investigations were requested because of the offsite groundwater impacts and the potential for site-related contaminant migration, and are discussed further in the OU-2 RI work plan (CH2M HILL 2013). A phased approach, or “follow-the-evidence” approach is being performed during the OU-2 RI. The first phase of the RI is designed to assess shallow groundwater conditions (i.e., groundwater at the water

table) near the residences immediately downgradient of the former Hanley Area. From a VI perspective, shallow groundwater VOC concentrations at the water table are of interest because this water-to-air interface is where volatilization of chemicals from groundwater first occurs. VOC concentrations in shallow groundwater are compared against conservative risk-based VI screening levels ([VISLs]; discussed in further detail in Section 5.3). Vapor intrusion investigations are being conducted at residences located within 100 feet of shallow groundwater VOC concentrations above VISLs. Various residences north of Stratford Avenue were selected during the OU-2 work planning phase based on groundwater concentrations observed in August 2010, before shallow monitoring wells were installed in 2013 as part of the OU-2 RI.

As noted, the OU-2 VI assessments include assessing shallow groundwater conditions near residences and collecting subslab soil gas, indoor air, and ambient (outdoor) air samples to assess the potential for site-related contaminant migration into offsite residences.

2. Previous VI Assessments at PP-3

A VI assessment was conducted at PP-3 in February 2012 that consisted of subslab soil gas, indoor air, and outdoor air samples as presented in the technical memorandum, *February 2012 Vapor Intrusion Assessment at Private Property 3, St. Louis, Missouri* (CH2M HILL 2012). The indoor air sample could not be analyzed because of contamination in the laboratory during the laboratory screening process. Although the indoor air sample could not be analyzed, the subslab soil gas sampling results indicate that the VI pathway is not of concern. This is because all chemicals measured in the subslab soil gas sample fell below screening levels. Additional investigation of the VI pathway at PP-3 was recommended and incorporated into the OU-2 RI work plan developed by the U.S. Army with input from MDNR and USEPA.

3. Objective

The primary objective at OU-2 is to evaluate the VI pathway and implement appropriate remedial actions, if necessary, to protect human health and the environment. The following objectives were developed and presented in the OU-2 RI work plan with input from MDNR and USEPA:

- Determine whether VI of site-related VOCs is occurring and is significant at offsite residences.
- Determine whether VI of site-related VOCs could occur to a significant extent in the future at offsite residences.
- Maintain proactive communication and responsiveness to the public throughout the OU-2 RI/feasibility study (FS).
- Obtain sufficient RI data to develop remedial alternatives during the FS (if needed).
- Develop a decision matrix that includes both short- and long-term response actions.

The OU-2 RI is assessing the VI pathway at select offsite residences north of the former Hanley Area in order to achieve these objectives.

4. Description of Residence

[redacted]

5. Methods

5.1 Building Survey

CH2M HILL performed a building survey on January 13, 2014, before conducting subslab soil gas, indoor air, and outdoor air sampling. The survey included a chemical inventory and an interview with the resident. During the February 2012 VI assessment, two 1-inch-diameter holes were observed in the basement floor in the HVAC room. The holes extended through the entire thickness of the floor. Subslab soil gas sample probe SG-01 was installed in one of the existing holes, about 6 feet east of the west exterior wall and 6 feet north of the south exterior wall. The other hole in the basement floor was plugged with Cement-All at the time that sample probe SG-01 was installed in February 2012

During the February 2012 site visit, the homeowner stated that the floor in the laundry room was removed and reinstalled in 2007 to replace a clay sanitary sewer pipe with polyvinyl chloride pipe. The homeowner said that several utilities ran beneath the floor in the laundry room. The homeowner also said that the laundry room floods once or twice a year because the floor drain backs up during heavy rains. During the 2014 interview with the homeowner, it was noted that flooding had not occurred between the February 2012 VI assessment and the January 2014 VI assessment. A sump was not observed in the basement.

Attachment 1 contains a copy of the completed building inspection form. Attachment 2 contains photographs of the sampling setup and canister placements.

5.2 Subslab Soil Gas Sampling

Subslab soil gas sampling began on January 13, 2014. The sampling location was identical to that used in February 2012: about 6 feet east of the west exterior wall and 6 feet north of the south exterior wall (Figure 3). The semipermanent subslab soil gas probe installed in the floor during the February 2012 VI assessment was used during the January 2014 assessment. As noted in the *February 2012 Vapor Intrusion Assessment at Private Property 3, St. Louis, Missouri,* the concrete slab is about ¾ inch thick.

The subslab soil gas sample probe installed in the basement at PP-3 was purged on January 13, 2014, and a 6-liter SUMMA canister was deployed for 24-hour sample collection. Before the subslab sample location was purged, the integrity of the seal was visually inspected for signs of cracks and shrinkage. No visible defect in the seal was noted. The floor drain was inspected for the presence of water. Distilled water was poured into the floor drain, and the sink in the laundry room was also allowed to run to allow water to fill the traps.

A total VOC reading was collected at the floor drain using a calibrated photoionization detector equipped with a 10.6 electron-volt lamp, as was an indoor air total VOC reading in the HVAC room. Total VOCs were not detected with the photoionization detector at the floor drain and in the HVAC room.

The sampling equipment was checked for leaks before purging and sampling activities. Leak check procedures were performed in accordance with the standard operating procedure (SOP) provided in the OU-2 RI work plan. The system maintained a consistent vacuum during the leak check, meaning the sampling equipment was airtight and not susceptible to outside interference during purging.

The subslab soil gas probe was also checked for leaks during purging and following the successful system leak check. Leak check procedures were performed in accordance with the SOP in the OU-2 RI work plan. The leak check was performed using 100 percent helium gas as a tracer to determine whether indoor air was infiltrating into the subslab sample probe during purging. Helium was released into an enclosure over the soil gas probe. At least 2 liters of subslab soil gas were purged into a 3-liter Tedlar bag during the leak check. Once the bag was filled, a helium leak detector was used to sample the bag for helium. No helium was detected within the purged subslab soil gas, demonstrating that the integrity of the soil gas probe and seal was not compromised.

A calibrated photoionization detector equipped with a 10.6 electron-volt lamp was used to sample the Tedlar bag containing the purged vapor for total VOCs. VOCs were not detected in the Tedlar bag containing vapor from sample locations SG-01.

An individually certified 6-liter SUMMA canisters was used to collect the subslab soil gas sample at SG-01. The initial canister vacuum was recorded using a standard pressure gauge installed on the canisters before they were deployed for subslab soil gas sample collection. The canister was opened on January 13 and remained open for roughly 24 hours. A flow controller set for 3.75 milliliters per minute allowed the canisters to fill over a period of roughly 24 hours.

CH2M HILL returned to the residence on January 14 and closed the sample port on the subslab soil gas canister. The arrival time was within 24 hours of opening the canisters to ensure that it had not reached atmospheric pressure before closing the valve. Attachment 2 provides photographs of the sampling setup and canister placement. Table 1 provides sampling details including canister vacuums measured before and after sampling.

5.3 Indoor Air and Outdoor Air Sampling

CH2M HILL deployed the sample canisters for indoor and outdoor air sampling on January 13, 2014. A 6-liter, individually certified SUMMA canister was placed in the basement of the residence and opened to collect an indoor air sample. The indoor air canister stood on a small end table about 5 feet north of the south exterior wall and 12 feet east of the west exterior wall, away from any observed chemicals (Figure 3). The intake was roughly 3 feet above the floor. The outdoor air sample canister was deployed near the side door on the east side of the residence (Figure 3). The initial canister vacuums were recorded using a standard pressure gauge installed on the canisters before they were deployed for sample collection. The canisters were kept open for 24 hours using a flow controller set for 3.75 milliliters per minute, which allowed the canisters to fill over a 24-hour period.

The sampling team returned to the residence on January 14, 2014 and closed the sample ports on the indoor air and outdoor air canisters. The team arrived at the residence within 24 hours of opening the canisters to ensure that they had not reached atmospheric pressure before closing the valves. Attachment 2 contains photographs of the sampling setup and canister placements. Table 1 summarizes sampling details, including canister vacuums measured before and after sampling.

5.4 Groundwater Sampling

Shallow monitoring wells MW-108S, MW-109S, and MW-123S, located near PP-3, were purged and sampled on December 18 and 19, 2013 for VOC analysis, in accordance with the SOPs for groundwater low-flow purging and sampling presented in the OU-2 RI work plan. The December 2013 groundwater sampling event consisted of collecting groundwater samples at all the existing monitoring wells to assess groundwater conditions. For the purpose of the VI assessment at PP-3, shallow groundwater samples collection within 100 feet of the residence are appropriate for assessing groundwater conditions at the top of the water table. Quality assurance/quality control samples (such as field duplicates, matrix spike/matrix spike duplicates) were collected at other monitoring wells during the groundwater sampling event. Monitoring wells were purged using a peristaltic pump with disposable tubing. Attachment 3 presents the groundwater quality parameters collected during purging. Groundwater investigation-derived waste was transferred into a 55-gallon drum (approved by the U.S. Department of Transportation) at the former Hanley Area for characterization and subsequent disposal.

5.5 Laboratory Analyses

The groundwater samples collected at MW-108S, MW-109S, and MW-123S were analyzed for VOCs using method SW 846 8260B. Sample containers were shipped to Empirical Laboratories in Nashville, Tennessee, for analysis of the following VOCs specified in the OU-2 RI work plan:

- Benzene
- Carbon tetrachloride
- Chloroform
- Naphthalene
- Methylene chloride
- 1,2-Dichloroethane (1,2-DCA)
- cis-1,2-Dichloroethene (cis-1,2-DCE)
- trans-1,2-Dichloroethene (trans-1,2-DCE)
- Vinyl chloride
- 1,1,1,2-tetrachloroethane (1,1,1,2-TeCA)
- 1,1,2,2-tetrachloroethane (1,1,2,2-TeCA)
- 1,1,2-trichloroethane (1,1,2-TCA)
- Tetrachloroethene (PCE)
- TCE

Subslab soil gas, indoor air, and outdoor air samples were analyzed for VOCs by method TO-15, Selective Ion Mode. The VOC reporting list consists of the compounds listed above except for 1,1,1,2-TeCA, which is not reported in the TO-15 analyte list. As discussed in the work plan, the omission of 1,1,1,2-TeCA in the reporting list is not considered a data gap, because the chemical has not been detected in any offsite groundwater samples. The detectable presence of 1,1,1,2-TeCA is limited only to MW-111, which is within the site boundaries of the former Hanley Area (Figure 2). The air canisters were shipped to Applied Science Laboratories in Corvallis, Oregon, for analysis.

The vacuum in each canister was measured using a standard vacuum gauge before and after sampling to verify that a sufficient sample volume was collected for laboratory analysis. Once the laboratory received the canisters, the vacuum in each canister was measured before analysis. As shown in Table 1, slightly different canister vacuums were measured in the field after sampling and at the laboratory before analysis. The laboratory measurements are considered more accurate, based on the quality of the fixed-based laboratory versus field pressure gauges. The differences between the field and laboratory measurements in Table 1 are small, indicating that the field pressure gauges were sufficiently representative. Sample leakage during transit does not appear to have occurred, based on the initial and final pressure measurements. Sufficient sample volume considered to be representative of the 24-hour sample period was present in each canister.

6. Findings

6.1 Chemical Inventory

A chemical inventory was conducted during the January 2014 VI assessment to record the amounts and types of chemicals stored within the residence. This information was collected to identify possible indoor sources of VOCs.

The quantity of chemicals observed in January 2014 in the basement at PP-3 has not changed significantly since the February 2012 inspection and VI assessment and was verified by referencing the February 2012 inventory sheet. Table 2 presents the chemical inventory recorded in January 2014. Attachment 1 contains a copy of the completed building inspection form.

Although VI guidance documents (USEPA 2002 and 2013, Interstate Technology & Regulatory Council 2007, Department of Defense 2009, and USEPA Draft VI Guidance 2013) state that known background indoor VOC sources should be removed at least 24 hours before sampling, it was not possible to do this for practical reasons. Removing all known or potential background indoor air sources of VOCs before sampling helps to minimize background contributions, but often it is not feasible or possible.

6.2 Other Field Observations

The weather was 49°F, cloudy, with more than 12 inches of snow on the ground, when the canisters were deployed on January 13. Barometric pressure was recorded at 29.63 inches of mercury and falling that day. On January 14, when the canisters were retrieved, the weather was 39°F, cloudy, with more than 12 inches of snow on the ground. Barometric pressure that day was recorded at 29.78 inches of mercury and steady. The heating system at PP-3 was operating during deployment of the subslab soil gas probe and indoor air canister.

6.3 Analytical Results

The screening criteria for groundwater, subslab soil gas, and indoor air presented in the OU-2 RI work plan are discussed below.

- **Groundwater**—In March 2012, USEPA released a VISL calculator that provides conservative default VISLs. The VISLs (November 2013 update) for groundwater were used and based on residential use, an attenuation factor of 0.001 for groundwater-to-indoor air, an excess lifetime cancer risk (ELCR) of 1×10^{-6}, and/or a noncancer hazard quotient (HQ) of 1.0.
- **Indoor and Outdoor Air**—The target indoor air concentrations provided in the VISL calculator were used and based on the ELCR and HQ identified above. Outdoor air data were used for comparison with indoor air

concentrations to determine if the measured indoor air concentrations are associated with outdoor air infiltration.

- **Subslab Soil Gas**—The target subslab and exterior soil gas concentrations provided in the VISL calculator were used and based on the ELCR and HQ identified above. The target subslab soil gas is the target indoor air concentration divided by the USEPA generic attenuation factor for soil gas (default value = 0.1).

Table 3 presents the December 2013 groundwater sampling results from shallow monitoring wells MW-108S, MW-109S, and MW-123S. Figure 4 lists VOCs detected above the VISLs in groundwater at MW-108S, MW-109S, and MW-123S. Table 4 presents the indoor air, outdoor air, and subslab soil gas concentrations measured at PP-3 in January 2014, and also results for February 2012.

Attachment 4 contains an assessment of data quality.

6.4 Screening Approach

Table 3 presents groundwater results from the December 2013 groundwater sampling event. TCE was detected at a concentration above the VISL at monitoring well MW-108S (29.4 µg/L).

As shown in Table 4, chloroform and naphthalene were detected at concentrations above VISLs in subslab soil gas in January 2014 Benzene, carbon tetrachloride, chloroform, and naphthalene were detected at concentrations above the VISLs in indoor air.

To assess the possible relationship between subslab soil gas and indoor air concentrations, the following lines of evidence were considered:

- Comparison of chemical concentrations in subslab soil gas and indoor air
- Comparison of chemical concentrations in indoor air and outdoor air
- Evaluation of chemical sources identified inside the home
- Evaluation of chemicals detected in groundwater

Each exceeding chemical was evaluated to assess its potential sources. The concentrations measured in February 2012 were compared to those measured in January 2014 to assess temporal changes.

Chloroform. Chloroform was measured in subslab soil gas at a concentration of 1.4 µg/m^3 and in indoor air at a concentration of 2.3 µg/m^3, exceeding its screening levels of 1.1 µg/m^3 (for subslab soil gas) and 0.11 µg/m^3 (for indoor air). It also was measured in outdoor air at a concentration of 0.16 µg/m^3.

In December 2013, chloroform was measured below the screening level in shallow groundwater at monitoring well MW-123S and not detected in shallow groundwater at monitoring wells MW-108S and MW-109S (Figure 4).

The concentration of chloroform in indoor air was higher than the concentration in subslab soil gas, suggesting a possible indoor source. Chloroform is a common background VOC in municipally treated water and household products (Agency for Toxic Substances & Disease Registry 1997).

Naphthalene. Naphthalene was measured at an indoor air concentration of 0.59 µg/m^3 and an outdoor air concentration of 0.18 µg/m^3 (estimated), exceeding the VISL of 0.072 µg/m^3. It was also measured at a concentration of 2.1 µg/m^3, above the VISL of 0.72 µg/m^3 in subslab soil gas.

Naphthalene was not detected in shallow groundwater in monitoring wells MW-108S, MW-109S, and MW-123S (Figure 4).

Although the potential for subsurface contributions to the indoor air cannot be ruled out since the subslab concentration exceeded the indoor air level by less than one order of magnitude, the lack of shallow groundwater detections at MW-108S, MW-109S, and MW-123S suggest the former Hanley Area is not likely the source.

Benzene. Benzene was measured at an indoor air concentration of 2 µg/m^3, exceeding the screening level of 0.31 µg/m^3. However, the outdoor air concentration was measured at a similar concentration of 0.93 µg/m^3 when compared with the indoor air concentration. Benzene was not detected in subslab soil gas.

Benzene was not detected in groundwater in monitoring wells MW-108S, MW-109S, and MW-123S (Figure 4).

Based on the 2014 results, the presence of benzene at similar concentrations in indoor and outdoor air suggest that benzene is originating from an outdoor chemical source.

Carbon Tetrachloride. Carbon tetrachloride was measured at an indoor air concentration of 0.449 µg/m^3, exceeding the screening level of 0.41 (µg/m^3). However, the outdoor air concentration was measured at a similar concentration of 0.32 µg/m^3 when compared with the indoor air concentration. Carbon tetrachloride was measured at a concentration of 0.039 µg/m^3, below the VISL of 4.1 µg/m^3.

Carbon tetrachloride was not detected in groundwater in monitoring wells MW-108S, MW-109S, and MW-123S (Figure 4).

Based on the 2014 results, the presence of carbon tetrachloride at similar concentrations in indoor and outdoor air suggest that benzene is originating from an outdoor chemical source.

7. Recommended Next Steps

Several chemical concentrations were measured above VISLs in indoor air and subslab soil gas at PP-3 in January 2014. However, indoor air concentrations measured in 2014 generally were comparable to those measured in 2012 and for many of the chemicals, background chemical sources such as household products or outdoor chemical releases such as automobile exhaust are responsible for the indoor air concentrations that exceeded screening levels. Chloroform is a common background VOC in municipally treated water and household products.

Although the potential for subsurface contributions of the chemical naphthalene to the indoor air cannot be ruled out since the subslab concentration exceeded the indoor air level by less than one order of magnitude, the lack of shallow groundwater detections at MW-108S, MW-109S, and MW-123S suggest the former Hanley Area is not likely the source. Additional investigation at PP-3 is needed to further assess whether contamination from the former Hanley Area may be contributing to potential VI. The second of three VI assessments will be conducted, in accordance with the OU-2 RI work plan, to assess temporal variability, which is consistent with USEPA (2013) VI guidance.

The Army will seek approval from the resident to perform the additional sampling.

8. References

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U.S. Environmental Protection Agency. 2013. *OSWER Final Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air (External Review Draft)*. April.

Tables

TABLE 1

Indoor Air, Outdoor Air, and Subslab Soil Gas Sampling Details

Vapor Intrusion Assessment, Private Property PP-3, St. Louis, Missouri

Sample Location	Canister ID	Purge Start Date and Time	Purge End Date and Time	Sampling Start Date and Time	Sampling End Date and Time	Medium Sampled	Initial Canister Vacuum (inches Hg)	Purge Vacuum (inches Hg)	Final Canister Vacuum Measured in Field After Sampling (in. Hg)	Final Canister Vacuum Measured at Laboratory (in. Hg)
PP03-AA-01	6L2529S	not applicable	not applicable	1/13/2014 11:00	114/2014 8:32:00 A	Ambient Air	-30	not applicable	-4	-2.8
PP03-IA-01	6L2557A	not applicable	not applicable	1/13/2014 10:57	1/14/2014 8:37	Indoor Air	-29	not applicable	-2	-2.9
PP03-SG-01	6L2543A	1/13/2014 10:33	1/13/2014 10:43	1/13/2014 10:56	1/14/2014 8:35	Soil Gas	-30	0	-9	-8.4

Note: Analytical method was TO-15 Selective Ion Mode.

inches Hg - inches of mercury

TABLE 2

Chemical Inventory

Vapor Intrusion Assessment, Private Property PP-3, St. Louis, Missouri

Household Name	Amount (Number and Size of Containers)	Chemical Present	Location
Faultless Heavy Starch	One 20 oz.		Laundry room
Regal Chlorinated Tables 3"	One 50 lbs.		HVAC room
Febreze Air Effects Hawaiian Aloha	One 9.7 oz.		Laundry room
Reeva Liquid Dish Detergent	One 24 oz.		Laundry room
Simple Green all purpose cleaner	One 32 oz.		Laundry room
Purell	One 150 oz.		Laundry room
Gentle Treatment No-Lye Conditioning Crème Relaxer	One kit		Laundry room
Epsom Salt	One 3 lbs.		Laundry room
Up & Up Clear Hand Soap	One 64 oz.		Laundry room
Up & Up Pro-Vitamin Shampoo	One 25.4 oz.		Laundry room
Breezy Dryer Sheets	Two 55-count		Laundry room
Family Solutions Bleach	One 1 gal.		Laundry room
Clorox Bleach	One 1 gal.		Laundry room
Tide Plus a Touch of Downy Liquid Detergent	One 100 oz.		Laundry room
Tide Ultra Powder Laundry Detergent	One 143 oz.		Laundry room
Tide Ultra Plus Bleach Powder Laundry Detergent	One 144 oz.		Laundry room
Equaline Hand Soap	Two 50 oz.		Laundry room
Rexall Hand Sanitizer	Two 725 mL		Laundry room

TABLE 3

Chemicals Detected in Groundwater at MW-108S, MW-109S, and MW-123S

Vapor Intrusion Assessment, Private Property PP-3, St. Louis, Missouri

Analyte	Location>> Sample Date>> Screening Level[1]	MW-108S 12/18/2013	MW-109S 12/18/2013	MW-123S 12/19/2013
1,1,1,2-Tetrachloroethane	3.2	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	2.8	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	4.5	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	1.9	0.5 U	0.5 U	0.5 U
Benzene	1.4	0.5 U	0.5 U	0.5 U
Carbon tetrachloride	0.36	0.5 U	0.5 U	0.5 U
Chloroform	0.71	0.5 U	0.5 U	**0.23 J**
cis-1,2-Dichloroethene	380[2]	**48.6**	0.5 U	0.5 U
Methylene chloride	720	**0.34 J**	1 U	1 U
Naphthalene	4	0.5 U	0.5 U	0.5 U
Tetrachloroethene	13	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	380	**1.72 J**	0.5 U	0.5 U
Trichloroethene	1.1	**29.4**	0.5 U	0.5 U
Vinyl chloride	0.14	0.5 U	0.5 U	0.5 U

Note: All units in micrograms per liter.

Screening levels are US Environmental Protection Agency Groundwater Vapor Intrusion Screening Level (VISL) for residential use (November 2013 update), an excess lifetime cancer risk (ELCR) of 1×10^{-6}, and/or a noncancer hazard quotient (HQ) of 1.0, unless otherwise noted.

[1] A USEPA VISL does not exist for cis-1,2-dichloroethene. For this reason, trans-1,2-dichloroethene was used as a surrogate for this chemical.

Bold indicates the analyte was detected

Shading indicates the analyte exceeded screening criteria

J = Reported value is estimated

U = Not detected above the laboratory reporting limit.

VOC = volatile organic compound

TABLE 4

Summary of Chemicals Detected in Outdoor Air and Subslab Soil Gas Samples: January 2014

Vapor Intrusion Assessment, Private Property PP-3, St. Louis, Missouri

Analyte	Location>> / Sample Date>> / Analytical Method>> / Indoor/Outdoor Air Screening Level[1]	PP03-IA-01 1/13/2014 TO-15 SIM Indoor Air	PP03-AA-01 2/16/2012 TO-15 SIM Outdoor Air	PP03-AA-01 1/13/2014 TO-15 SIM Outdoor Air	Subslab Soil Gas Screening Level[1]	PP03-SG-01 2/16/2012 TO-15 SIM Subslab Soil Gas	PP03-SG-01 FD 2/16/2012 TO-15 SIM Subslab Soil Gas	PP03-SG-01 1/13/2014 TO-15 SIM Subslab Soil Gas
1,1,2,2-Tetrachloroethane	0.042	0.061 U	0.023 U	*0.061 U*	0.42	0.024 U	**0.079 J**	0.076 U
1,1,2-Trichloroethane	0.15	0.048 U	**0.091 J**	**0.022 J**	1.5	0.019 U	**0.030 J**	0.061 U
1,2-Dichloroethane (1,2-DCA)	0.094	**0.083**	**0.077 J**	**0.059 J**	0.94	**0.015 J**	0.014 U	0.045 U
Benzene	0.31	**2**	**0.88**	**0.93**	3.1	**0.18**	**0.19**	0.21 U
Carbon tetrachloride	0.41	**0.44**	**0.53**	**0.32**	4.1	**0.072 J**	**0.073 J**	**0.039 J**
Chloroform	0.11	**2.3**	**0.11 J**	**0.16**	1.1	**1.0**	**1.0**	**1.4**
cis-1,2-Dichloroethene	63[2]	0.035 U	0.033 U	0.035 U	630[2]	**0.059 J**	0.033 U	0.044 U
Methylene chloride	96	**0.32**	**0.33 J**	**0.28**	960	0.0082 U	**0.068 J**	0.049 U
Naphthalene	0.072	**0.59**	**0.13 J**	**0.18 J**	0.72	**0.16 J**	**0.19**	**2.1**
Tetrachloroethene (PCE)	9.4	**0.13**	**0.13 J**	**0.18**	94	**2.3**	**2.2**	**1.6**
trans-1,2-Dichloroethene	63	0.035 U	0.13 U	0.035 U	630	**0.036 J**	0.013 U	0.044 U
Trichloroethene (TCE)	0.43	0.10 U	0.064 U	0.10 U	4.3	**0.41**	**0.40**	**0.044 J**
Vinyl Chloride	0.16	0.022 U	0.0085 U	0.022 U	1.6	0.0089 U	0.0085 U	0.028 U

Note: All units in micrograms per cubic meter.

All units = micrograms per cubic meter.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

NA - Not Analyzed

U - Analyte was not detected above the method detection limit.

Bold indicates the analyte was detected above the method detection limit.

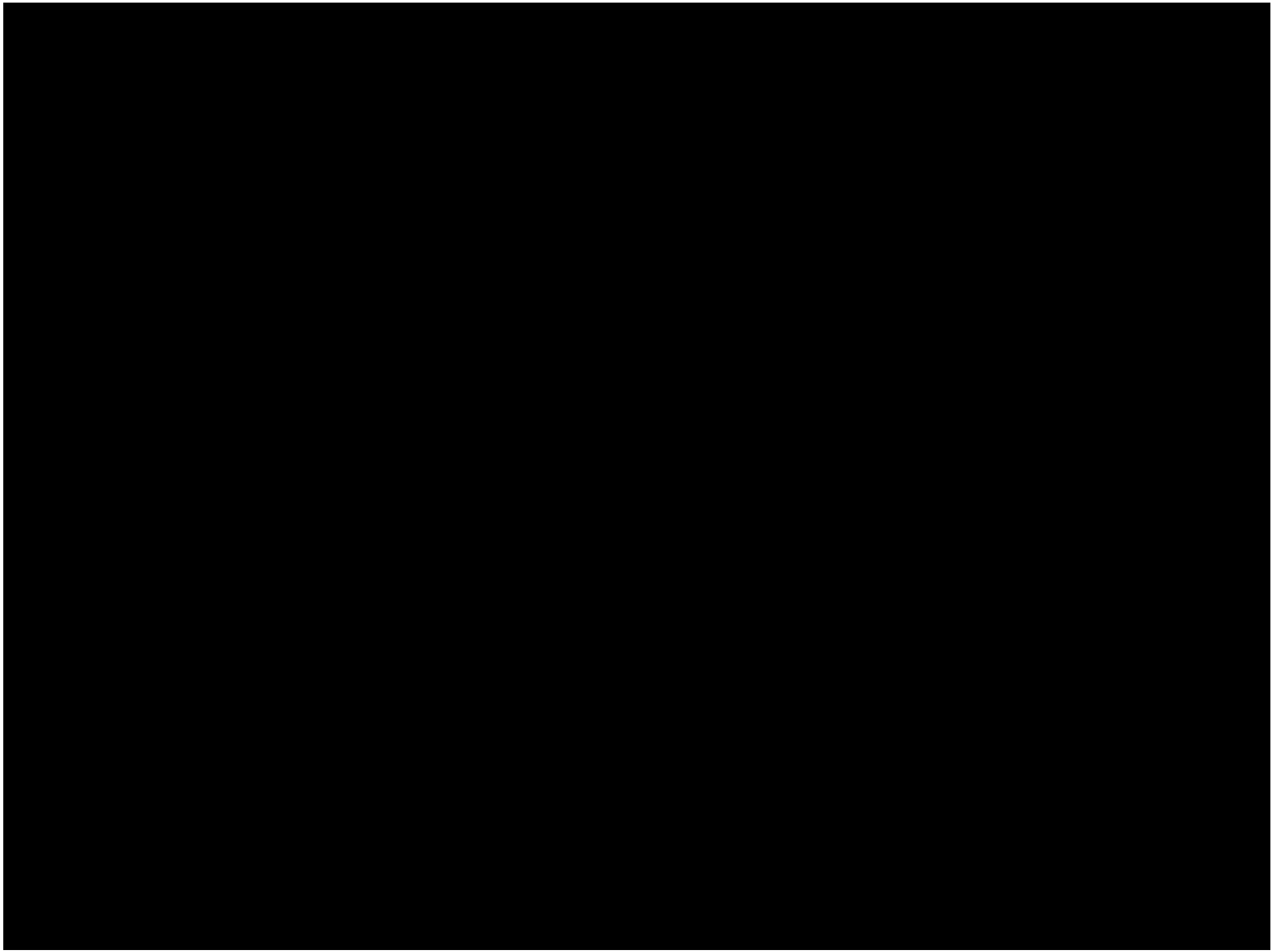
Bold and shading indicates the result was detected and exceeded screening criteria.

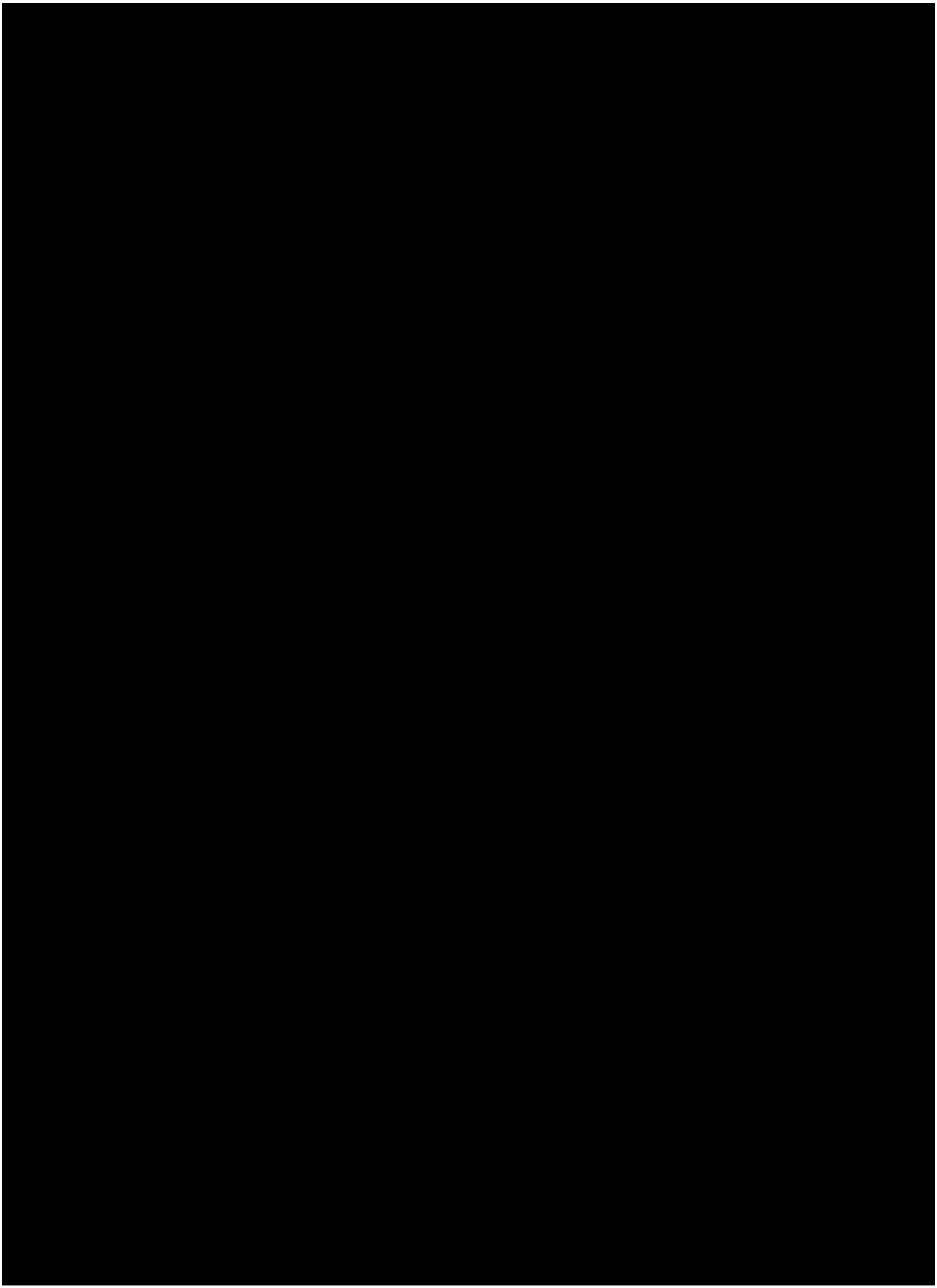
Italicized values represent nondetected chemicals with a method detection limit that exceeded the screening level.

[1] U.S. Environmental Protection Agency (USEPA) Vapor Intrusion Screening Level (VISL) for residential use (November 2013 update), an excess lifetime cancer risk (ELCR) of 1 × 10-6, and/or a noncancer hazard quotient (HQ) of 1.0, unless otherwise noted.

[2] A USEPA VISL does not exist for cis-1,2-dichloroethene. For this reason, trans-1,2-dichloroethene was used as a surrogate for this chemical.

Figures





Attachment 1
Building Inspection Forms

Building Survey - Indoor Air Sampling

CH2MHILL

Project Information

Project Name: St. Louis Ordnance Plant
Project # : 459603.01.VI.RS.02
Survey Completed By: T. Swierczek
Date: 01/13/14
Building Address: Private Property 3
Residence ID: PP-3

Resident and Contact Information

Name of Occupant: Private Owner
Owner / Tenant / Other: Owner
Occupant Phone #s: Home: Work: Cell:
Duration at Current Residence: 6 years
Best Time To Call / Visit:
Number of Building Occupants: Children (list ages): Adults: 3
(If Rental) Property Owner Name: *Owner Phone #s: Home:*
Owner Address: *Work:*
Name of Interviewee for Building Survey: Owner
Notes: [redacted]

Building Construction Characteristics

Building Type: (Check box for all that apply)

- [X] Single Family Residential
- [ ] Multi Family Residential
- [ ] Commercial
- [X] Ranch
- [ ] Two-story
- [ ] Other (specify):
- [ ] Split Level
- [ ] Tri Level
- [ ] Duplex (# of other half of duplex):
- [ ] Apartment (# of units in Building):

Describe Building: (General Description, Construction Materials, etc.) Brick structure

Approximate Age: # years **Approximate Area:** Total Living Space: 1,480 sq.ft. First Floor: 1,000 sq.ft.

Floors: # Floors at or above grade: 1

Which floors of the residence are utilized as living space / occupied? Main floor and basement

Foundation Type:

Crawl Space: No
Slab on Grade: No
Basement: Yes

Foundation Description: (Split Foundation or Multiple Types)

Poured concrete walls

Slab & Crawl Space Construction:

Basement or Crawl Space Details: (if applicable)

Finished Basement: Yes
Basement Finished When: 2007
Approximate Area: 500 sq.ft.

Basement or Crawl Space Floor: (Check box for all that apply)

- [X] Concrete
- [ ] Dirt
- [ ] Floating (built on top of actual floor)
- [ ] Other (specify):

Foundation Walls: (Check box for all that apply)

- [X] Poured Concrete
- [ ] Block
- [ ] Stone
- [ ] Other (specify):

Does the basement or crawl space have a moisture problem - dampness? (Check only one)

- [ ] Yes, frequently (3 or more times/year)
- [X] Yes, occasionally (1-2 times/year)
- [ ] Yes, rarely (less than 1 time/year)
- [ ] No

Is the basement or crawl space ever wet - flooded? (Check only one)

- [ ] Yes, frequently (3 or more times/year)
- [ ] Yes, occasionally (1-2 times/year)
- [ ] Yes, rarely (less than 1 time/year)
- [X] No

Building Address: **PP-3** Date: **1/13/2014**

Basement or Crawl Space Details Continued: (if applicable)

Does the basement have any of the following? (Check all that apply)

[ ] Floor cracks [ ] Wall cracks [X] Floor Drain [ ] Sump pump

[ ] O her hole / opening in floor (describe):

Is he sump pump used? Depth of sump? Where does the sump pump drain?

Describe ventila ion of crawl space:

Description of ground cover outside of building: [X] Grass [X] Concrete [ ] Asphalt [ ] Other:

Heating & Ventilation Systems

Heating System - Fuel Type: (Check box for all that apply)

[X] Natural Gas [ ] Electric [ ] Coal [ ] Fuel Oil

[ ] Wood [ ] O her (specify):

Heating - Conveyance System: (Check box for all that apply)

[X] Forced Hot Air [ ] Electric Baseboard [ ] Wood Stove [ ] Fireplace

[ ] Forced Hot Water [ ] Hot Water Radiation [ ] Heat Pump [ ] Kerosene Heater

[ ] Other (specify):

Type of Ventilation System: (Check box for all that apply)

[X] Central air handler / blower [ ] Mechanical / ceiling fans [ ] Bathroom ventilation fans [ ] Air-to-air heat exchanger

[ ] Kitchen range hood fan [ ] O her (specify):

Does the Residence have Air Conditioning: (Check box for all that apply)

[X] Central Air Conditioning [ ] Window Air Conditioners [ ] Other (specify):

Describe the current operating conditions of the HVAC system: **HVAC system is currently operational. Furnace was running at the time of the inspection.**

Miscellaneous Information

Does the Residence have any of the following?

Septic System? **No** Irriga ion / Private Well?

Existing subsurface depressurization (radon) system in place? **No** Is it running?

Is here standing water outside the residence (pond, ditch, swale)? **No** If so, describe:

Has he residence been retrofitted / weatherized with any of the following? (Check box for all that apply)

[X] Insulation [X] Storm Windows [ ] Energy-efficient windows [ ] O her (specify):

Does the building have an attached garage? **No** If so, is a car usually parked in the garage?

Chemicals

Have any pesticides / herbicides been applied around the building founda ion or in the yard / gardens? **No**

If so, when - and which chemicals?

Has he residence had a pesticide treatment inside? **No** When / by whom?

Do the occupants of the building have their clothes dry-cleaned? **Yes**

When were dry-cleaned clo hes last brought into the building? **Infrequent (~3 year ago)**

Have the occupants ever noticed any unusual odors in the buidling? **Yes**

Describe (with location): **Unusual odor in basement bathroom during the morning hours**

Building Address: **PP-3** Date: **1/13/2014**

Miscellaneous Information Continued:

Have there been any known spills of a chemical immediately outside or inside the building? **No**

Describe (with location):

Do any of he occupants smoke inside the building? **No** How often?

Do any of he occupants use solvents at work? **No** Are their clothes washed at home? **Yes**

If so, when - and what rooms? **Clothes are regularly washed. Washer and dryer are located in the basement.**

Within the last 6 months, has there been any painting or remodeling in the residence? **No** If so, when

What rooms, and what specifically was done?

Within the last 6 months, has any new carpeting been installed? **No** Have the carpets or rugs been cleaned? **No**

If so, when, what rooms, and what cleaners?

Consumer Products Inventory

Check consumer products that are present in the residence.

		Storage Location	Frequency of Usage	Date of Last Use
☐	Paint or Wood Finishes (spray or can)			
☐	Paint stripper / remover / thinner			
☐	Solvent cleaners (eg. spray-on oven cleaner)			
☐	Metal degreaser / cleaner			
☐	Gasoline / diesel fuel			
☐	Glues or adhesives (super glue, etc)			
☐	Air fresheners & scented candles			
☐	Laundry / carpet spot removers			
☐	Pesticides / Insecticides			
☐	Nail polish remover (acetone)			
☐	Aerosols (deodorizers, polish, cleaners)			
☐	O her:			
☐	O her:			
☐	O her:			

Describe any products that are containerized during sampling event:

Refer to chemical inventory form.

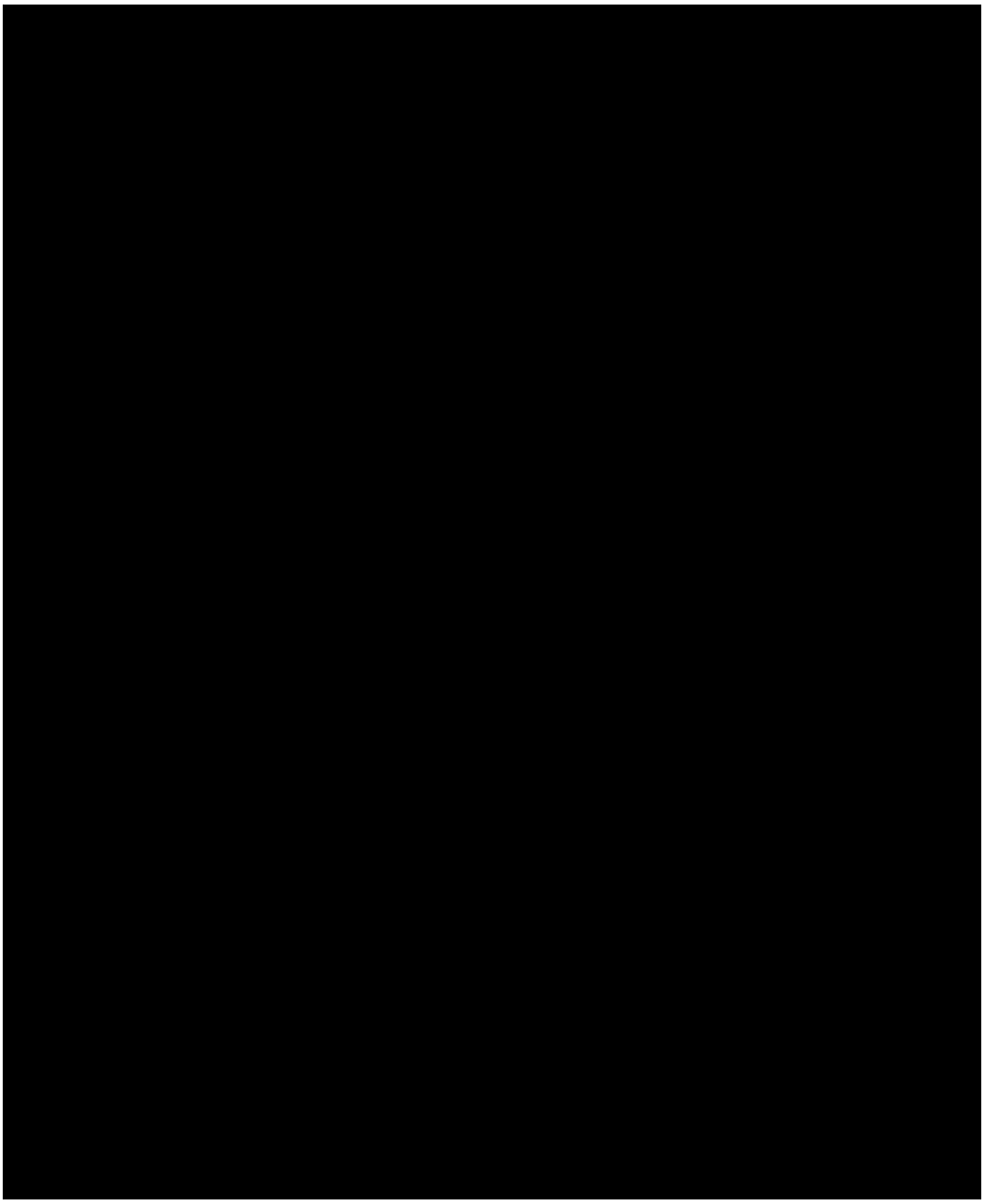
Provide any additional information that is provided by interviewee:

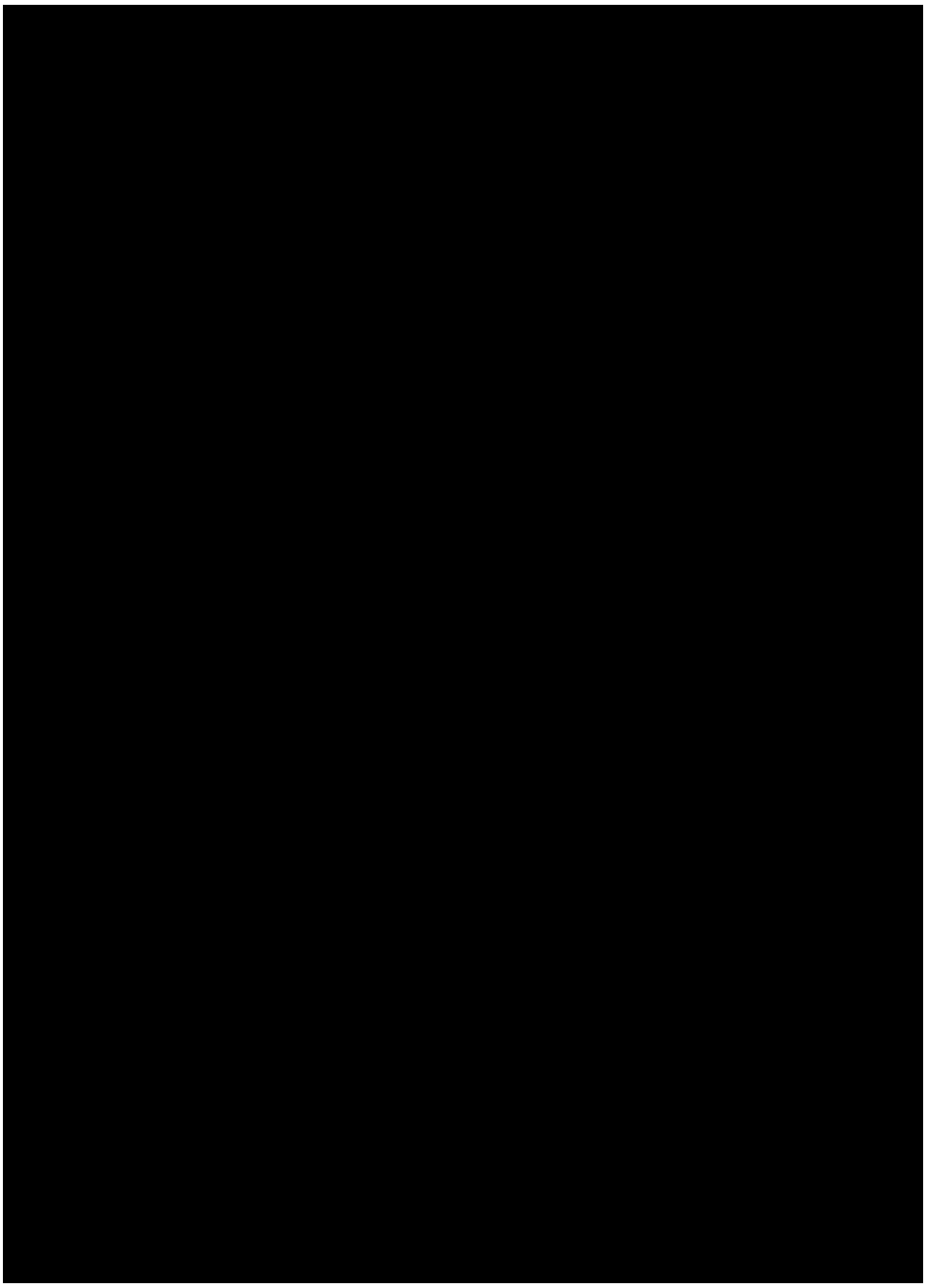
Drain located in laundry room backs up 1-2 times per year.

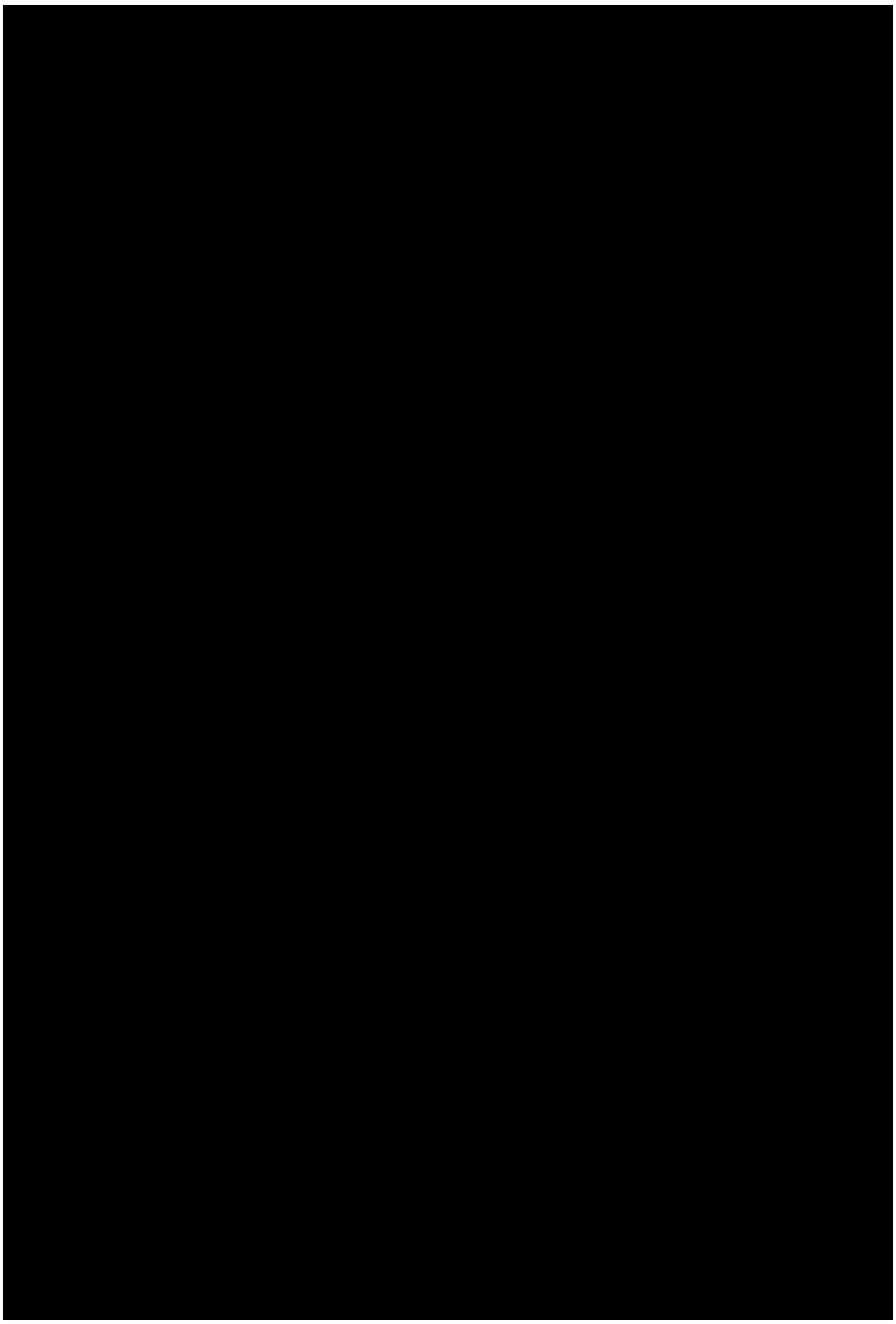
Attachment 2
Photographs

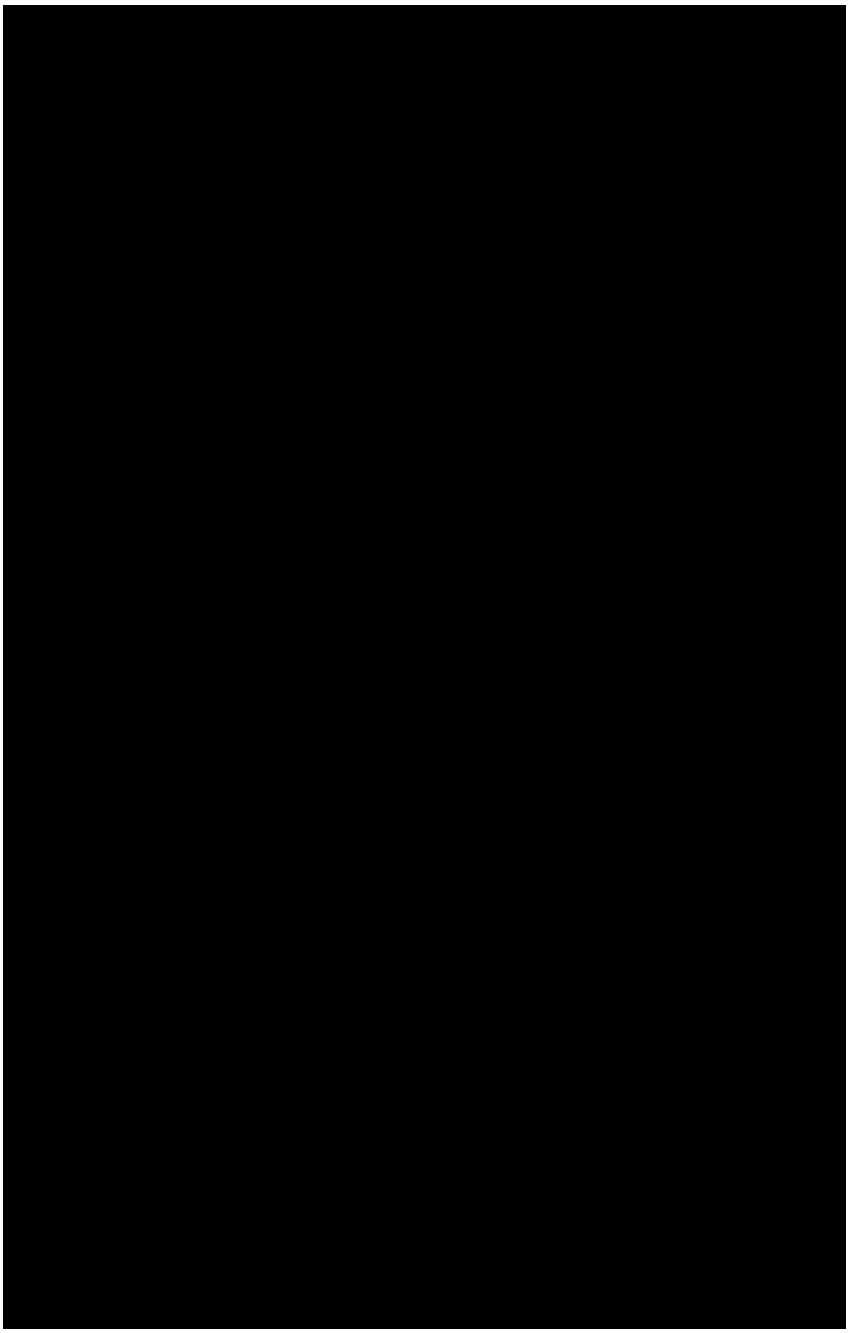
ATTACHMENT 2

Private Property PP-3 Photograph Log









Attachment 3
Groundwater Sampling Forms

Groundwater Purging and Sampling Form

Project Name: SLOP OU-2
Project Number: 459603.01.VI.GW
Sheet 1 of 1
Sample Source (Well No./Location): MW-108S
Date: 12/18/2013
Weather Conditions: 31 degrees, sunny
Well Condition: Good
Sample Team: Mike Rodriguez
Sample Equipment: Peristaltic Pump

Well Stabilization Data

Datum: BTOC
Well Volume:
Time Purging begins (T_o) 1022
Well Depth: 13 (ft)
1V = _____(gal)
Water Level at time T_o 2.88
Static Water Level: 3.43 (ft)
3V = _____(gal)
Time Purging ends (T_1) 1043
Water Column: 9.57 (ft)
5V = _____(gal)
Water Level at time T_1 3.44
Diameter : 2 " PVC
Pumping System Volume 0.54 (L)

Time	Volume Removed	pH ± 0.1	SPCOND (mS/cm) ± 20 µmho/cm[1]	TEMP.(C) ± 0.5	Redox (mV) ± 10 mV	Water level (Ft) < 1.0 ft	D.O. (mg/L) ± 10%[2]	Turbidity (NTU)	Purge rate (Lpm)	Appearance
10:22 AM	0.0	6.64	1.180	12.79	91.3	2.88	4.55	18.5	0.1	Clear
10:25 AM	0.3	6.64	1.185	12.91	96.6	3.03	4.28	6.06	0.1	Clear
10:28 AM	0.6	6.64	1.191	12.97	77.8	3.20	4.37	2.82	0.1	Clear
10:31 AM	0.9	6.63	1.189	13.09	61.6	3.31	4.28	1.73	0.1	Clear
10:34 AM	1.2	6.62	1.189	13.13	53.1	3.34	4.25	1.61	0.1	Clear
10:37 AM	1.5	6.62	1.189	13.14	50.1	3.39	4.25	1.42	0.1	Clear
10:40 AM	1.8	6.62	1.185	13.15	56.8	3.44	4.05	1.36	0.1	Clear
10:43 AM	2.1	6.62	1.82	13.15	56.8	3.44	4.05	1.36	0.1	Clear

[1] Specific conductance: ± 1% of full-scale reading (instrument repeatability) or default ± 20 µmho/cm
[2] Dissolved oxygen: ± 0.1 mg/L for values < 1 mg/L, or ± 10% for values >1 mg/L

Sample Information

Sample ID: MW-108S-121813
Analysis: Select VOCs
Date: 12/18/2013
Time: 10:48 AM
Field Filtering: _____ Filter Type _____
Laboratory: Empirical Method of Shipment: FedEx
Remarks: _____

Groundwater Purging and Sampling Form

Project Name: SLOP OU-2
Project Number: 459603.01.VI.GW
Sheet 1 of 1
Sample Source (Well No./Location): MW-109S
Date: 12/18/2013
Weather Conditions: 31 degrees, sunny
Well Condition: Good
Sample Team: Tony Swierczek
Sample Equipment: Peristaltic Pump

Well Stabilization Data

Datum: BTOC
Well Volume:
Time Purging begins (T_o) 1023
Well Depth: 13 (ft)
1V = _____(gal)
Water Level at time T_o 3.23
Static Water Level: 3.40 (ft)
3V = _____(gal)
Time Purging ends (T_1) 1038
Water Column: 9.60 (ft)
5V = _____(gal)
Water Level at time T_1 3.48
Diameter : 2 " PVC
Pumping System Volume 0.54 (L)

Time	Volume Removed (L)	pH ± 0.1	SPCOND (mS/cm) ± 20 µmho/cm[1]	TEMP. (C) ± 0.5	Redox (mV) ± 10 mV	Water level (Ft) < 1.0 ft	D.O. (mg/L) ± 10%[2]	Turbidity (NTU)	Purge rate (Lpm)	Appearance
10:23 AM	0.0	6.5	1.185	13.39	-9.7	3.23	5.52	1.96	0.1	Clear
10:26 AM	0.3	6.37	1.186	13.25	6.9	3.31	4.87	2.09	0.1	Clear
10:29 AM	0.6	6.35	1.185	13.22	12.7	3.35	4.77	1.22	0.1	Clear
10:32 AM	0.9	6.31	1.187	13.20	18.8	3.39	4.76	1.81	0.1	Clear
10:35 AM	1.2	6.27	1.188	13.34	27	3.44	4.63	1.38	0.1	Clear
10:38 AM	1.5	6.32	1.189	13.4	23.4	3.48	4.34	1.04	0.1	Clear

[1] Specific conductance: ± 1% of full-scale reading (instrument repeatability) or default ± 20 µmho/cm
[2] Dissolved oxygen: ± 0.1 mg/L for values < 1 mg/L, or ± 10% for values >1 mg/L

Sample Information

Sample ID: MW-109S-121813
Analysis: Select VOCs
Date: 12/18/2013
Time: 10:40 AM
Field Filtering: _____ Filter Type _____
Laboratory: Empirical Method of Shipment: FedEx
Remarks: _____

Groundwater Purging and Sampling Form

Project Name: SLOP OU-2
Project Number: 459603.01.VI.GW
Sheet 1 of 1
Sample Source (Well No./Location): MW-123S
Date: 12/19/2013
Weather Conditions: 45 degrees, partly couldy
Well Condition: Good
Sample Team: Tony Swierczek
Sample Equipment: Peristaltic Pump

Well Stabilization Data

Datum: BTOC
Well Volume:
Time Purging begins (T_o) 0933
Well Depth: 13 (ft)
1V = _____(gal)
Water Level at time T_o 3.71
Static Water Level: 3.64 (ft)
3V = _____(gal)
Time Purging ends (T_1) 0951
Water Column: 9.36 (ft)
5V = _____(gal)
Water Level at time T_1 4.00
Diameter : 2 " PVC
Pumping System Volume 0.54 (L)

Time	Volume Removed (L)	pH ± 0.1	SPCOND (mS/cm) ± 20 µmho/cm[1]	TEMP. (C) ± 0.5	Redox (mV) ± 10 mV	Water level (Ft) < 1.0 ft	D.O. (mg/L) ± 10%[2]	Turbidity (NTU)	Purge rate (Lpm)	Appearance
9:33 AM	0	7.66	1.286	13.86	74.8	3.71	6.66	2.81	0.1	Clear
9:36 AM	0.3	7.61	1.293	13.7	64.1	3.75	5.99	2.21	0.1	Clear
9:39 AM	0.6	7.56	1.294	13.67	63.3	3.8	5.50	3.07	0.1	Clear
9:42 AM	0.9	7.53	1.294	13.76	62.7	3.85	5.66	2.63	0.1	Clear
9:45 AM	1.2	7.52	1.294	13.86	61.5	3.9	5.67	2.35	0.1	Clear
9:48 AM	1.5	7.51	1.295	13.86	60.4	3.95	5.50	2.75	0.1	Clear
9:51 AM	1.8	7.5	1.296	13.89	59.1	4.00	5.47	2.58	0.1	Clear

[1] Specific conductance: ± 1% of full-scale reading (instrument repeatability) or default ± 20 µmho/cm
[2] Dissolved oxygen: ± 0.1 mg/L for values < 1 mg/L, or ± 10% for values >1 mg/L

Sample Information

Sample ID: MW-123S-121913
Analysis: Select VOCs
Date: 12/19/2013
Time: 09:55 AM
Field Filtering: _____ Filter Type _____
Laboratory: Empirical Method of Shipment: FedEx
Remarks: _____

Attachment 4
Data Quality Evaluation Report

Data Quality Evaluation Report for Vapor Intrusion Assessment for Private Property 3

PREPARED FOR: U.S. Army Corps of Engineers–Kansas City District

PREPARED BY: CH2M HILL

DATE: March 17, 2014

Introduction

The object of the data quality evaluation was to assess the quality of analytical results for groundwater, indoor air, ambient outdoor air, and subslab soil gas samples collected December 18–19, 2013, and January 13, 2014, respectively, during the vapor intrusion assessment for Private Property 3 (PP-3) at former Hanley Area of the St. Louis Ordnance Plant in St. Louis, Missouri. Individual method requirements and guidelines from the Uniform Federal Policy-*Final Quality Assurance Project Plan, RI/FS Activities for Operable Unit 2, St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri* (OU-2 RI work plan) (CH2M HILL 2013) were used as the basis for this assessment.

Analytical Approach

The object of sampling and analysis for the vapor intrusion assessment for PP-3 was to determine the presence or absence of volatile organic compounds contamination in groundwater and air at the site.

Analytical Data

The data quality evaluation covers three normal groundwater samples, one ambient air normal sample, one indoor air normal sample, one soil gas normal sample and two trip blanks. The data were reported in sample delivery groups 1312151, 1312159, and N1077. Table 1 lists the samples and collection dates. The air samples were delivered to CH2M HILL's Applied Sciences Laboratory in Corvallis, Oregon, and analyzed by Method TO-15 SIM. The groundwater samples were delivered to Empirical Laboratories LLC in Nashville, Tennessee, and analyzed by Method SW8260B.

TABLE 1

Samples Associated with Data Quality Evaluation

St. Louis Ordnance Plant Vapor Intrusion Assessment Report for PP-3, St. Louis, Missouri

Matrix	Sample ID	QA/QC Type	Sample Date	Sample Delivery Group
AIR	PP03-AA-01-011314	Normal	January 13, 2014	N1077
AIR	PP03-IA-01-011314	Normal	January 13, 2014	N1077
AIR	PP03-SG-01-011314	Normal	January 13, 2014	N1077
Water	MW-108S-121813	Normal	December 18, 2013	1312151
Water	MW-109S-121813	Normal	December 18, 2013	1312151
Water	Trip Blank 02692	Trip blank	December 18, 2013	1312151
Water	MW-123S-121913	Normal	December 19, 2013	1312159
Water	Trip Blank 02691	Trip blank	December 19, 2013	1312159

AA = ambient air
IA = indoor air
SG = soil gas
MW = monitoring well

One hundred percent of the data were reviewed and verified in accordance with the OU-2 RI work plan. The review included the following items:

- A review of the sample delivery group narrative to identify issues that the laboratory reported in the data deliverable
- A check of sample integrity (chain of custody, preservation, and holding times)
- An evaluation of quality control measurements used to assess the accuracy, precision, and representativeness of data including instrument tuning, internal standards, calibrations, quality control blanks, laboratory control samples, laboratory control sample duplicates, matrix spike samples, matrix spike sample duplicates, surrogate recoveries, and field or laboratory duplicate results
- A review of sample results, target compound lists, and detection limits to verify that project analytical requirements were met
- A review to verify that corrective actions were initiated, as necessary, based on the data review findings
- Qualification of the data using appropriate qualifier flags, as necessary, to reflect data usability limitations

Data flags were assigned according to the OU-2 RI work plan. The flags and the reason for each flag were entered into the electronic database. Multiple flags are routinely applied to specific sample method, matrix, and analyte combinations, but there will be only one final flag. The data reported will be qualified by a single flag that reflects the most conservative of the applied validation qualifiers. The final flag also includes matrix and blank sample impacts. The data flags are defined as follows:

J The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.

R The sample result was rejected because of serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

U The analyte was analyzed for but was not detected above the reported sample quantitation limit.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Findings

The findings of the data review and verification are summarized in the following sections. As noted, the flags in the final data tables reflect the most severe verification qualifier. Table 2 lists the verification findings, along with the verification reason codes.

TABLE 2
Verification Findings
St. Louis Ordnance Plant Vapor Intrusion Assessment Report for PP-3, St. Louis, Missouri

Matrix	Method	Analyte	Sample ID	Result	Units	Validation Reason	Final Validation Flag
Air	TO15 SIM	Trichloroethene	PP03-AA-01-011314	0.102	µg/m^3	U	CanCert < RL
Air	TO15 SIM	Trichloroethene	PP03-IA-01-011314	0.107	µg/m^3	U	CanCert < RL
Air	TO15 SIM	Benzene	PP03-SG-01-011314	0.215	µg/m^3	U	LB < RL
Air	TO15 SIM	Methylene chloride	PP03-SG-01-011314	0.049	µg/m^3	U	LB < RL

CanCert < RL The analyte was detected in the canister at a concentration less than the reporting limit.
LB < RL The analyte was detected in the method blank at a concentration less than the reporting limit.

Attachment 1 contains the laboratory reports. Groundwater samples not associated with PP-3 are included in the sample delivery groups, but review and verification for those samples are not part of the data quality evaluation.

Holding Times

All holding time criteria were met.

Calibration

All initial and continuing calibration requirements were met.

Method Blanks

Method blanks were analyzed at the required frequency and were free of contamination with the following exceptions. Benzene and methylene chloride were detected at concentrations less than the limit of quantitation in the method blank associated with Method TO-15 SIM. The data were qualified as not detected and flagged "U," when the associated sample concentrations were less than 5 times (10 times for methylene chloride) the concentration detected in the blank.

Field Blanks

Field blanks were collected and analyzed as required and were free of contamination.

Field Duplicates

A field duplicate was collected at the required frequency of 1 for every 10 normal samples collected per matrix. However, the field duplicates collected were not associated with PP-3 and therefore are not included in this memorandum.

Matrix Spikes

A matrix spike/matrix spike duplicate was collected at the required frequency of one MS/MSD for every 20 normal groundwater samples per the OU-2 RI work plan. However, matrix spikes/matrix spike duplicates collected were not associated with PP-2 and therefore are not included in this memorandum.

Surrogates

Surrogates were used according to method requirements and all acceptance criteria were met.

Laboratory Control Samples

Laboratory control samples and laboratory control sample duplicates were analyzed as required, and all acceptance criteria were met.

Internal Standards

Internal standard recovery criteria were met for all samples.

Certifications of Canisters and Flow Controllers

The air and soil gas samples were collected in SUMMA canisters, which were certified by the laboratory per project instructions before shipment to the project site. However, the laboratory was unable to certify all canisters and flow controllers clean to the detection limit for all target analytes. Therefore, some low-level detections in the samples may be due to contamination in the canisters and flow controllers.

The canisters and flow controllers were free of contamination with the following exceptions. Several analytes were detected in canisters or flow controllers at concentrations below the reporting limit. Data were qualified as not detected and flagged "U" when sample concentrations were less than five times the concentrations detected in the canisters or flow controllers.

Chain of Custody

Each sample was documented in a completed chain of custody and received at the laboratory in good condition.

Overall Assessment

The goal of the data quality assessment was to demonstrate that a sufficient number of representative samples were collected and that the resulting analytical data can be used to support the decision-making process. The procedures for assessing the precision, accuracy, representativeness, completeness, and comparability parameters were based on the approved OU-2 RI work plan. The following summary highlights the findings:

- Precision of the data was verified through the review of laboratory data quality indicators that include RPDs for laboratory control samples and laboratory control sample duplicates. Precision was acceptable.
- Accuracy of the data was verified through the review of the calibration data, laboratory control samples, laboratory control sample duplicates, internal standards, and surrogate standard recoveries, and the evaluation of the method blank, field blank, SUMMA canister, and flow controller data. Accuracy generally was acceptable except for a few analytes that were qualified as not detected because of contamination in the method blank, canister, or flow controller. Data users should consider the impact to any qualified result, as it may contain a bias that could affect the decision-making process.
- Representativeness of the data was verified through sample collection, storage, and verification of holding time compliance. All data were reported from analyses within the USEPA-recommended holding time.
- Comparability of the data was verified through the use of standard USEPA analytical procedures and standard units for reporting. Results obtained are comparable to industry standards in that the collection and analytical techniques followed approved, documented procedures.
- Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements compared to planned measurements. Valid data are those not rejected for project use. All data were considered valid. The completeness goal of 90 percent was met for all analytes and methods.

Attachment 1
Laboratory Data Packages

ANALYTICAL DATA PACKAGE
SDG # 1312151

PROJECT NAME: ST. LOUIS ORDINANCE PLANT
PROJECT LOCATION: ST. LOUIS, MO
CONTRACT #: 953646

SUBMITTAL TO:
Shane Lowe
CH2M HILL, Inc.
1034 South Brentwood Blvd., Suite 2300
Richmond Heights, MO 63117

SUBMITTAL BY:
Empirical Laboratories, LLC (EL)
621 Mainstream Drive, Suite 270
Nashville, TN 37228
Tel (615)345-1115
Fax (866)417-0548

LABORATORY CONTACT PERSON:
Project Manager: Sonya Gordon
Tel (615)345-1115
Fax (866)417-0548
Email: sgordon@empirlabs.com

Original Report Date: January 8, 2014
Report Revision #: N/A
Revision Date: N/A
Total # of Pages: 65

THIS DOCUMENT MEETS DoD QSM 4.2 STANDARDS

The results relate to only the samples associated with the referenced SDG and the submitted data has been produced in accordance with laboratory procedures. The Laboratory's Technical Lab Director, Mr. Rick Davis, is responsible for the final data produced and reported. His signature is listed at the end of the Case Narrative within the Analytical Data Package. If applicable to this report package, details on report revisions and the information on subcontracted analysis are listed in the package Case Narrative. This report shall not be reproduced, except in full, without the written approval of Empirical Laboratories, LLC.

L-A-B Accredited Certificate Number L2226

Table of Contents

Sample Delivery Group Case Narrative

Receipt Information
The samples were received within the preservation guidelines for the associated methods. The information associated with sample receipt and the Sample Delivery Group (SDG) are included within section 4 of this package, which also provides information on the link between the client sample ID listed on the COC and laboratory's assigned unique sample ID or WorkOrder #. The sample is tracked through the laboratory for all analysis via the assigned WorkOrder #.

All samples that were received were analyzed and none of the samples were placed on hold without analyses. There were no subcontracted analyses for this SDG.

Changes to the Revision
This is an original submittal of the final report package.

Analytical Information
All samples were prepped (where applicable) and analyzed within the standard allowed holding times, unless noted within the exceptions listed below. The laboratory analyzed all samples within the program and method guidelines. Sample prep and dilution information is provided within the final results report and at the beginning of each form set. The following information is provided specific to individual methods:

Chromatographic Flags for Manual Integration:
The following letters are used to denote manual integrations on the laboratory's raw data in association with chromatographic integrations:

A: The peak was manually integrated as it was not integrated in the original chromatogram.
B: The peak was manually integrated due to resolution or coelution issues in the original chromatogram.
C: The peak was manually integrated to correct the baseline from the original chromatogram.
D: The peak was manually integrated to identify the correct peak as the wrong peak was identified in the original chromatogram.
E: The peak was manually integrated to include the entire peak as the original chromatogram only integrated part of the peak.

SW8260B:

Note –Sample 1312151-04 was analyzed at a 2x due to the sample foaming during screening. Samples 1312151-06 and -07 were analyzed at a 50x based on screen results but were over-diluted and re-analyzed as 1312151-06RE1 and -07RE1 at 20x dilutions. The original analyses for samples 1312151-06 and -07 are not included in the report.

No additional anomalies or deviations are noted.

Data Qualifiers
As applicable and where required, the following general qualifiers are associated with the sample results. Additional qualifiers will be specified within the reporting sections of the data package or within the body of the Case Narrative.

Analytical Report Terms and Qualifiers

DL: The detection limit (DL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The DL is supported by the method detection limit (MDL) which is determined from analysis of a sample containing the analyte in a given matrix.

LOD: The Limit of Detection is an estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory-dependent. This definition is further clarified in the DoD QSM 4.2 revisions as the smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%). At the LOD, the false negative rate (Type II error) is 1%.

LOQ: The Limit of Quantitation is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. This term is further clarified within the DoD QSM 4.2 as the lowest concentration that produces a quantitative result within specified limits of precision and bias.

*****: Exceeding quality control criteria are associated with the reported result.

B: The presence of a "B" to the right of an analytical value indicates that this compound was also detected in the method blank and the data should be interpreted with caution. One should consider the possibility that the correct sample result might be less than the reported result and, perhaps, zero.

D: When a sample (or sample extract) is rerun diluted because one of the compound concentrations exceeded the highest concentration range for the standard curve, all of the values obtained in the dilution run will be flagged with a "D".

E: The concentration for any compound found which exceeds the highest concentration level on the standard curve for that compound will be flagged with an "E". Usually the sample will be rerun at a dilution to quantitate the flagged compound. For Metals, the qualifier indicates that the serial dilution was outside of the control limits and the compound should be considered estimated due to the presence of interference.

H1: The result was analyzed outside of the EPA recommended holding time.

H2: The result was extracted outside of the EPA recommended holding time.

H3: The sample for this analyte was received outside of the EPA recommended holding time.

J: The presence of a "J" to the right of an analytical result indicates that the reported result is estimated. The mass spectral data pass the identification criteria showing that the compound is present, but the calculated result is less than the LOQ. One should feel confident that the result is greater than zero and less than the LOQ.

M: Indicates that the sample matrix interfered with the quantitation of the analyte. In dual column analysis the result is reported from the column with the lower concentration. In inorganics, it indicates that the parameters DL/LOD/LOQ have been raised.

N: The MS/MSD accuracy and/or precision are outside criteria. The predigested spike recovery is not within control limits for the associated parameter.

P: The associated numerical value is an estimated quantity. There is greater than a 40% difference between the two GC columns for the detected concentrations. The higher of the two values is reported unless matrix interference is obvious or for HPLC analysis where the primary column is reported.

Q: The relative percent difference (RPD) and/or percent recovery exceeded limits in the associated Blank Spike and/or Blank Spike Duplicate.

S: The associated internal standard exceeded criteria.

U: The presence of a "U" indicates that the analyte was analyzed for but was not detected or the concentration of the analyte quantitated below the DL.

X: The parameter shows a potential positive bias on a reported concentration due to an ICV or CCV exceeding the upper control limit on the high side.

Y: The parameter shows a potential negative bias on a reported concentration due to an ICV or CCV exceeding the lower control limit on the low side.

Z: The parameter shows lack of confirmation/detection, which may be due to a negative bias in the ICV or CCV which exceeds the lower control limit.

LIMS Definitions / Naming Conventions:

The following are general naming conventions that are used throughout the laboratory; however, on a method by method basis, there are additional QAQC items that are named in a consistent format.

BLK: LIMS assigns a unique identifier to the Method Blank by naming it as the letters BLK appended to the Batch ID. A Method Blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The Method Blank is used to assess for possible contamination during preparation and/or analysis steps. Method Blanks within a Batch or Analytical sequence will be appended with a numerical value beginning with 1 that will increase incrementally.

BS: LIMS assigns a unique identifier to the Blank Spike by naming it as the letters BS appended to the Batch ID. The Blank Spike or Lab Control Sample is a controlled analyte-free matrix, which is spiked with known and verified concentrations of target analytes. Spiking concentrations can be referenced in the method SOP. The BS is used to evaluate the viability of analytes taken through the entire prep (when applicable) and analytical process. Blank Spikes within a Batch or Analytical sequence will be appended with a numerical value beginning with 1 that will increase incrementally. A duplicate Blank Spike will be designated as a BSD.

MS: The LIMS assigns each Client sample with a unique identifier. The Matrix Spike is designated with a MS at the end of the sample's unique identifier. The Matrix Spike sample is used to assess the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. A duplicate Matrix Spike will be designated as a MSD.

IDs: The LIMS assigns each Client sample with a unique identifier. The letter "RE" may potentially be appended to the end of the LIMS Sample ID. And "**RE"** implies that the sample was either re-prepped, re-analyzed straight, or re-analyzed at a dilution. Subsequent re-analysis for the sample will be appended with a numerical value beginning with 1 that will increase incrementally. Eg: RE1, RE2, RE3, etc.

Statement of Data Authenticity:
I certify that, based upon my inquiry of those individuals immediately responsible for obtaining the information and to the best of my knowledge, the data package is in compliance with the terms and conditions of the contract, both technically and for completeness, with the exception of the conditions detailed in this Case Narrative, as verified by my signature below. During absences, Ms. Marcia K. McGinnity or an approved technical designee is authorized to sign this Statement of Data Authenticity.

Mr. Rick D. Davis
Laboratory Technical Director / VP Operations

Empirical Laboratories, LLC
Certifications/Approvals
(Revised 12/16/2013)

DoD ELAP, Certificate Number L2226
- Aqueous
- Non-aqueous
- Expires: 11/30/2015

State of Florida, Department of Health – NELAP, Lab ID: E87646
- Clean Water Act
- RCRA/CERCLA
- Expires: 06/30/2014

State of Georgia, Environmental Protection Agency – NELAP
- Expires: 06/30/2014

State of Illinois, Environmental Protection Agency – NELAP, Certificate No.: 003300
- Groundwater
- Solid and Hazardous Waste
- Expires: 09/13/2014

State of Kansas Department of Health and Environment – NELAP, Certificate No.: E-10407
- Aqueous
- Non-aqueous
- Expires: 04/30/2014

State of Kentucky Department of Environmental Protection – NELAP, Certificate No.: 77
- Aqueous
- Non-aqueous
- Expires: 06/30/2014

State of Nevada, Department of Conservation and Natural Resources – NELAP, Certificate No.: TN000042013-1
- Aqueous
- Non-aqueous
- Expires: 07/31/2014

State of New Jersey Department of Environmental Protection – NELAP, Lab ID: TN473
- Water Pollution
- Solid and Hazardous Waste
- Expires: 06/30/2014

State of North Carolina, Department of Environment and Natural Resources - Certificate No.: 643
- Aqueous
- Non-aqueous
- Expires: 12/31/2014

State of North Dakota, Department of Health – NELAP, Certificate No.: R-204
- Aqueous
- Non-aqueous
- Expires: 06/30/2014

State of Texas, Commission on Environmental Quality – NELAP, Certificate No.: T104704307-13-8
- Aqueous
- Non-aqueous
- Expires: 12/31/2013

State of Utah, Department of Health – NELAP, Certificate No.: TN0042013-5
- Aqueous
- Non-aqueous
- Expires: 07/31/2014

Commonwealth of Virginia, Department of General Services – VELAP, Certificate No.: 2558 – Lab ID: 460243
- Aqueous
- Non-aqueous
- Expires: 12/14/2014

State of Washington, Department of Ecology – NELAP, Lab ID: C934-13
- Groundwater
- Solid and Hazardous Waste
- Expires: 03/18/2014

ORGANIC CALCULATIONS

GC/MS Volatiles

$$\text{Final Concentration} = \frac{\text{On-column(ug/L or ug/Kg) * Expected Vol/Weight (mL or g) * Dilution}}{\text{Initial Vol/Weight (mL or g) * (Percent Solids/100) (if applicable)}}$$

Note - Expected Vol/Weight value is found in "Final Vol" column of Preparation Batch Summary.

GC/MS Extractables

$$\text{Final Concentration} = \frac{\text{On-column(ng/uL) * Final Vol (ml) * Dilution *(1000uL/mL)}}{\text{Initial Vol/Weight (mL or g) * (Percent Solids/100) (if applicable)}}$$

= ng/mL or ng/g

= ug/L or ug/kg

GC or LC Extractables

$$\text{Final Concentration} = \frac{\text{On-column(ng/mL) * Final Vol (mL) * Dilution}}{\text{Initial Vol/Weight (mL or g) * (Percent Solids/100) (if applicable)}}$$

= ng/mL or ng/g

= ug/L or ug/kg

Sample Receipt Information

1312151

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

21332

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 877-345-1113 ♦ (fax) 866-417-0548

Send Results to:	Send Invoice to:
Name Shane Lowe	Name
Company CH2M Hill	Company
Address 1034 S. Brentwood	Address
City St. Louis	City
State, Zip MO, 63117	State, Zip
Phone 314-335-3000	Phone
Fax	Fax
E-mail shane.lowe@ch2m.com	E-mail

Project No./Name: 459603 / SLDP OU-2

Sampler's (Signature):

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	Benzene, Carbon tet.	Chloroform, 1,2-DCA	cis-1,2-DCE, trans-1,2-DCE	Methylene chloride	1,1,2,2-TeCA, 1,1,2-TCA	Naphthalene, 1,1,2-TCA	PCE, TCE, VC	Comments	No. of Bottles	Lab Use Only Containers/Pres.
01	12/18/13 0936	MW-108-121813	GW	X	X	X	X	X	X	X		3	
02	12/18/13 1000	MW-109-121813		X	X	X	X	X	X	X		3	
03	12/18/13 1040	MW-109S-121813		X	X	X	X	X	X	X		3	
04	12/18/13 1048	MW-108S-121813		X	X	X	X	X	X	X		3	
05	12/18/13 1252	MW-116-121813		X	X	X	X	X	X	X		3	
06	12/18/13 1255	MW-110-121813		X	X	X	X	X	X	X		3	
07	12/18/13 1300	FD-01-121813		X	X	X	X	X	X	X		3	
08	12/18/13 1400	Trip Blank #02692		X	X	X	X	X	X	X		2	

Analysis Requirements:

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:

CAR #:

Relinquished by: (Signature)	Date/Time:	Received By: (Signature)
	12/18/13 1500	
Relinquished by: (Signature)	Date/Time:	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time:	Temperature:
	12/19/13 0926	-0.8 int.

REMARKS:

Details:

Page 1 of 1

Cooler No. 1 of 1

Date Shipped 12/18/13

Shipped By TS

Turnaround STD

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1312151

EMPIRICAL LABORATORIES
COOLER RECEIPT FORM

Cooler Received/Opened On: 12/19/13 0925 Workorder# 1312151

1. Tracking # 6141 (last 4 digits, FedEx)

   Courier: FedEx

2. Temperature of rep. sample or temp blank when opened: -0.9 °C + *correction factor (+0.1)* = -0.8 °C

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO (NA)

4. Were custody seals on outside of cooler? (YES) NO NA

   If yes, how many and where: Two - Top

5. Were the seals intact, signed, and dated correctly? (YES) NO NA

6. Were custody papers inside cooler? (YES) NO NA

I certify that I opened the cooler and answered questions 1-6 (initial) [signature]

7. Were custody seals on containers: YES (NO) and Intact YES NO (NA)

   Were these signed and dated correctly? YES NO (NA)

8. Packing material used? (Bubblewrap) (Plastic bag) Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: (Ice) Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? (YES) NO NA

11. Were all container labels complete (#, date, signed, pres., etc)? (YES) NO NA

12. Did all container labels and tags agree with custody papers? (YES) NO NA

13. a. Were VOA vials received? (YES) NO NA

    b. Was there any observable headspace present in any VOA vial? YES (NO) NA

14. Was there a Trip Blank in this cooler? (YES) NO NA If multiple coolers, sequence # ____

I certify that I unloaded the cooler and answered questions 7-14 (initial) JG

15. a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES NO (NA)

    b. Did the bottle labels indicate that the correct preservatives were used YES NO (NA)

16. Was residual chlorine present? YES NO (NA)

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (initial) JG

17. Were custody papers properly filled out (ink, signed, etc)? (YES) NO NA

18. Did you sign the custody papers in the appropriate place? (YES) NO NA

19. Were correct containers used for the analysis requested? (YES) NO NA

20. Was sufficient amount of sample sent in each container? (YES) NO NA

I certify that I entered this project into LIMS and answered questions 17-20 (initial) JG

I certify that I attached a label with the unique LIMS number to each container (initial) JG

I certify that I have performed a second check of the LIMS information against the COC to confirm accuracy (initial) ____

21. Were there Non-Conformance issues at login? YES (NO) Was a NCR generated? YES (NO) # ____

Additional Details:

1312151

Empirical Laboratories, LLC

Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Project Manager: Sonya Gordon
Project Number: CH2_SLOP

Report To:
CH2M Hill, Inc.
Shane Lowe
1034 South Brentwood Blvd, Suite 2300
Richmond Heights, MO 63117
Phone: (314) 335-3024
Fax: (314) 421-3927

Invoice To:
CH2M Hill, Inc.
Accounts Payable
P.O.Box 241329
Denver, CO 80224-____
Phone :(303) 771-0952
Fax: (303) 771-0952

Due to Client: 01/14/2014 16:00 *This is the projected due date to the client, at the time of receipt, and is for report delivery via upload, and/or email, and/or shipment to meet TAT as setup by project*

Received By: Joshua T Gross
Date Received: 12/19/2013 09 25
Logged In By: Joshua T Gross
Date Logged In: 12/19/2013 15 47

Samples Received at: **-0.8 C**

Custody Seals	Yes	Received On Ice	Yes
Containers Intact	Yes		
COC/Labels Agree	Yes		
Preservation Confirme	No		

Method	Test Code	Due	TAT	Expires	Comments
1312151-01 MW-108-121813 [Water] Sampled 12/18/2013 09:36 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/09/2014 14:00	15	01/01/2014 09:36	See versions lowMDLs DIL Approval Required
1312151-02 MW-109-121813 [Water] Sampled 12/18/2013 10:00 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/09/2014 14:00	15	01/01/2014 10:00	See versions lowMDLs DIL Approval Required
1312151-03 MW-109S-121813 [Water] Sampled 12/18/2013 10:40 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/09/2014 14:00	15	01/01/2014 10:40	See versions lowMDLs DIL Approval Required
1312151-04 MW-108S-121813 [Water] Sampled 12/18/2013 10:48 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/09/2014 14:00	15	01/01/2014 10:48	See versions lowMDLs DIL Approval Required
1312151-05 MW-116-121813 [Water] Sampled 12/18/2013 12:52 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/09/2014 14:00	15	01/01/2014 12:52	See versions lowMDLs DIL Approval Required
1312151-06 MW-110-121813 [Water] Sampled 12/18/2013 12:55 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/09/2014 14:00	15	01/01/2014 12:55	See versions lowMDLs DIL Approval Required
1312151-07 FD-01-121813 [Water] Sampled 12/18/2013 13:00 Central 'Field Duplicate'					
SW8260B	VOC_8260B_REG	01/09/2014 14:00	15	01/01/2014 13:00	See versions lowMDLs DIL Approval Required

1312151

Empirical Laboratories, LLC

Client:	**CH2M Hill, Inc.**	**Project Manager:**	**Sonya Gordon**
Project:	**St. Louis Ordnance Plant**	**Project Number:**	**CH2_SLOP**

Method	Test Code	Due	TAT	Expires	Comments
1312151-08 Trip Blank #02692 [Water] Sampled 12/18/2013 14:00 Central 'Trip Blank'					
SW8260B	VOC_8260B_REG	01/09/2014 14:00	15	01/01/2014 14:00	See versions lowMDLs DIL Approval Required

Reviewed By

Date

Sample Delivery Group Assignment Form

CLIENT: CH2M Hill, Inc.
PROJECT NAME: St. Louis Ordnance Plant
SDG #: 1312151

QC LEVEL: Level III
Report Due: 1/14/2014
Client Sample Count: 6

Sample Type	Sampled	Received	Lab ID	Client ID	Report Matrix	SW8260B
Client Sample	12/18/2013	12/19/2013	1312151-01	MW-108-121813	Water	X
Client Sample	12/18/2013	12/19/2013	1312151-02	MW-109-121813	Water	X
Client Sample	12/18/2013	12/19/2013	1312151-03	MW-109S-121813	Water	X
Client Sample	12/18/2013	12/19/2013	1312151-04	MW-108S-121813	Water	X
Client Sample	12/18/2013	12/19/2013	1312151-05	MW-116-121813	Water	X
Client Sample	12/18/2013	12/19/2013	1312151-06	MW-110-121813	Water	X
Field Duplicate	12/18/2013	12/19/2013	1312151-07	FD-01-121813	Water	X
Trip Blank	12/18/2013	12/19/2013	1312151-08	Trip Blank #02692	Water	X

Data for SW8260B Forms

Sample Extraction Data

Prep Method: 5030B-SW8260B

Lab Number [Field ID]	Batch	Nominal Initial/Final	Initial [mL]	Final [mL]	Dilution	% Solids	Notes	Date
1312151-01 [MW-108-121813]	3L24002	5 00/5 00	5 00	5 00	1 00			12/24/13
1312151-02 [MW-109-121813]	3L24002	5 00/5 00	5 00	5 00	1 00			12/24/13
1312151-03 [MW-109S-121813]	3L24002	5 00/5 00	5 00	5 00	1 00			12/24/13
1312151-04 [MW-108S-121813]	3L24002	5 00/5 00	5 00	5 00	2 00			12/24/13
1312151-05 [MW-116-121813]	3L24002	5 00/5 00	5 00	5 00	1 00			12/24/13
1312151-08 [Trip Blank #02692]	3L24002	5 00/5 00	5 00	5 00	1 00			12/24/13

Sample Extraction Data

Prep Method: 5030B-SW8260B

Lab Number [Field ID]	Batch	Nominal Initial/Final	Initial [mL]	Final [mL]	Dilution	% Solids	Notes	Date
1312151-06RE1 [MW-110-121813]	3L27001	5 00/5 00	5 00	5 00	20 00			12/27/13
1312151-07RE1 [FD-01-121813]	3L27001	5 00/5 00	5 00	5 00	20 00			12/27/13

ANALYSIS DATA SHEET

MW-108-121813

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312151-01 File ID: 1215101.D

Sampled: 12/18/13 09:36 Prepared: 12/24/13 13:51 Analyzed: 12/24/13 13:51

Solids: Preparation: 5030B Dilution: 1

Batch: 3L24002 Sequence: 3L36509 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene	**0.730**	0.140	0.500	1.00	J
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.04	93.5	75 - 120	
Dibromofluoromethane	30.00	29.97	99.9	85 - 115	
1,2-Dichloroethane-d4	30.00	29.98	99.9	70 - 120	
Toluene-d8	30.00	29.99	100	85 - 120	

ANALYSIS DATA SHEET

MW-109-121813

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312151-02 File ID: 1215102.D

Sampled: 12/18/13 10:00 Prepared: 12/24/13 14:19 Analyzed: 12/24/13 14:19

Solids: Preparation: 5030B Dilution: 1

Batch: 3L24002 Sequence: 3L36509 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene	**0.310**	0.140	0.500	1.00	J
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride	**0.220**	0.120	1.00	2.00	J
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene	**0.760**	0.190	0.500	1.00	J
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.84	96.1	75 - 120	
Dibromofluoromethane	30.00	29.66	98.9	85 - 115	
1,2-Dichloroethane-d4	30.00	31.77	106	70 - 120	
Toluene-d8	30.00	30.50	102	85 - 120	

ANALYSIS DATA SHEET

MW-109S-121813

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312151-03 File ID: 1215103.D

Sampled: 12/18/13 10:40 Prepared: 12/24/13 14:46 Analyzed: 12/24/13 14:46

Solids: Preparation: 5030B Dilution: 1

Batch: 3L24002 Sequence: 3L36509 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.83	96.1	75 - 120	
Dibromofluoromethane	30.00	30.46	102	85 - 115	
1,2-Dichloroethane-d4	30.00	29.82	99.4	70 - 120	
Toluene-d8	30.00	29.56	98.5	85 - 120	

ANALYSIS DATA SHEET

MW-108S-121813

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312151-04 File ID: 1215104D.D

Sampled: 12/18/13 10:48 Prepared: 12/24/13 17:04 Analyzed: 12/24/13 17:04

Solids: Preparation: 5030B Dilution: 2

Batch: 3L24002 Sequence: 3L36509 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.300	1.00	2.00	U
56-23-5	Carbon tetrachloride		0.340	1.00	2.00	U
67-66-3	Chloroform		0.340	1.00	2.00	U
107-06-2	1,2-Dichloroethane		0.320	1.00	2.00	U
156-59-2	cis-1,2-Dichloroethene	**48.6**	0.280	1.00	2.00	D
156-60-5	trans-1,2-Dichloroethene	**1.72**	0.440	1.00	2.00	JD
75-09-2	Methylene chloride	**0.340**	0.240	2.00	4.00	JD
91-20-3	Naphthalene		0.320	1.00	2.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.280	1.00	2.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.300	1.00	2.00	U
127-18-4	Tetrachloroethene		0.460	1.00	2.00	U
79-00-5	1,1,2-Trichloroethane		0.400	1.00	2.00	U
79-01-6	Trichloroethene	**29.4**	0.380	1.00	2.00	D
75-01-4	Vinyl chloride		0.280	1.00	2.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.33	94.4	75 - 120	
Dibromofluoromethane	30.00	29.22	97.4	85 - 115	
1,2-Dichloroethane-d4	30.00	30.37	101	70 - 120	
Toluene-d8	30.00	30.11	100	85 - 120	

ANALYSIS DATA SHEET

MW-116-121813

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312151-05 File ID: 1215105.D

Sampled: 12/18/13 12:52 Prepared: 12/24/13 15:14 Analyzed: 12/24/13 15:14

Solids: Preparation: 5030B Dilution: 1

Batch: 3L24002 Sequence: 3L36509 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride	**0.190**	0.120	1.00	2.00	J
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.94	96.5	75 - 120	
Dibromofluoromethane	30.00	30.17	101	85 - 115	
1,2-Dichloroethane-d4	30.00	30.41	101	70 - 120	
Toluene-d8	30.00	30.22	101	85 - 120	

ANALYSIS DATA SHEET

MW-110-121813

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312151-06RE1 File ID: 1215106D.D

Sampled: 12/18/13 12:55 Prepared: 12/27/13 13:38 Analyzed: 12/27/13 13:38

Solids: Preparation: 5030B Dilution: 20

Batch: 3L27001 Sequence: 3L36510 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		3.00	10.0	20.0	U
56-23-5	Carbon tetrachloride		3.40	10.0	20.0	U
67-66-3	Chloroform		3.40	10.0	20.0	U
107-06-2	1,2-Dichloroethane	**11.0**	3.20	10.0	20.0	JD
156-59-2	cis-1,2-Dichloroethene	**157**	2.80	10.0	20.0	D
156-60-5	trans-1,2-Dichloroethene		4.40	10.0	20.0	U
75-09-2	Methylene chloride	**7.40**	2.40	20.0	40.0	JD
91-20-3	Naphthalene		3.20	10.0	20.0	U
79-34-5	1,1,2,2-Tetrachloroethane		2.80	10.0	20.0	U
630-20-6	1,1,1,2-Tetrachloroethane		3.00	10.0	20.0	U
127-18-4	Tetrachloroethene	**3010**	4.60	10.0	20.0	D
79-00-5	1,1,2-Trichloroethane		4.00	10.0	20.0	U
79-01-6	Trichloroethene	**135**	3.80	10.0	20.0	D
75-01-4	Vinyl chloride		2.80	10.0	20.0	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	29.27	97.6	75 - 120	
Dibromofluoromethane	30.00	29.43	98.1	85 - 115	
1,2-Dichloroethane-d4	30.00	32.45	108	70 - 120	
Toluene-d8	30.00	29.75	99.2	85 - 120	

ANALYSIS DATA SHEET

FD-01-121813

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312151-07RE1 File ID: 1215107D.D

Sampled: 12/18/13 13:00 Prepared: 12/27/13 14:06 Analyzed: 12/27/13 14:06

Solids: Preparation: 5030B Dilution: 20

Batch: 3L27001 Sequence: 3L36510 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		3.00	10.0	20.0	U
56-23-5	Carbon tetrachloride		3.40	10.0	20.0	U
67-66-3	Chloroform		3.40	10.0	20.0	U
107-06-2	1,2-Dichloroethane	**10.2**	3.20	10.0	20.0	JD
156-59-2	cis-1,2-Dichloroethene	**159**	2.80	10.0	20.0	D
156-60-5	trans-1,2-Dichloroethene		4.40	10.0	20.0	U
75-09-2	Methylene chloride	**8.80**	2.40	20.0	40.0	JD
91-20-3	Naphthalene		3.20	10.0	20.0	U
79-34-5	1,1,2,2-Tetrachloroethane		2.80	10.0	20.0	U
630-20-6	1,1,1,2-Tetrachloroethane		3.00	10.0	20.0	U
127-18-4	Tetrachloroethene	**2940**	4.60	10.0	20.0	D
79-00-5	1,1,2-Trichloroethane		4.00	10.0	20.0	U
79-01-6	Trichloroethene	**132**	3.80	10.0	20.0	D
75-01-4	Vinyl chloride		2.80	10.0	20.0	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.13	93.8	75 - 120	
Dibromofluoromethane	30.00	29.77	99.2	85 - 115	
1,2-Dichloroethane-d4	30.00	30.81	103	70 - 120	
Toluene-d8	30.00	29.06	96.9	85 - 120	

ANALYSIS DATA SHEET

Trip Blank #02692

Laboratory:	Empirical Laboratories, LLC			SDG:	1312151
Client:	CH2M Hill, Inc.			Project:	St. Louis Ordnance Plant
Matrix:	Water	Laboratory ID:	1312151-08	File ID:	1215108.D
Sampled:	12/18/13 14:00	Prepared:	12/24/13 10:38	Analyzed:	12/24/13 10:38
Solids:		Preparation:	5030B	Dilution:	1
Batch:	3L24002	Sequence:	3L36509	Calibration:	3352001
Instrument:	MS-VOA6				

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	29.15	97.2	75 - 120	
Dibromofluoromethane	30.00	30.06	100	85 - 115	
1,2-Dichloroethane-d4	30.00	30.21	101	70 - 120	
Toluene-d8	30.00	29.99	100	85 - 120	

SURROGATE STANDARD RECOVERY AND RT SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Sequence: 3L36509
Instrument: MS-VOA6
Calibration: 3352001

Surrogate Compound	Spike Level	% Recovery	Recovery Limits	RT	CCV RT	RT Diff	RT Diff Limit	Q
Calibration Check (3L36509-CCV1) ug/L				Lab File ID: 1224CCV1.D		Analyzed: 12/24/13 07:24		
Bromofluorobenzene	30.00	102	80 - 120	12.04	12.04	0.0000	+/-1.000	
Dibromofluoromethane	30.00	97.1	80 - 120	6.71	6.71	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	102	80 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	98.0	80 - 120	9.42	9.42	0.0000	+/-1.000	
LCS (3L24002-BS1) ug/L				Lab File ID: 1224LCS1.D		Analyzed: 12/24/13 07:53		
Bromofluorobenzene	30.00	99.2	75 - 120	12.04	12.04	0.0000	+/-1.000	
Dibromofluoromethane	30.00	97.8	85 - 115	6.71	6.71	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	97.0	70 - 120	7.2	7.21	-0.0100	+/-1.000	
Toluene-d8	30.00	98.2	85 - 120	9.42	9.42	0.0000	+/-1.000	
Blank (3L24002-BLK1) ug/L				Lab File ID: 1224BLK1.D		Analyzed: 12/24/13 09:43		
Bromofluorobenzene	30.00	96.4	75 - 120	12.03	12.04	-0.0100	+/-1.000	
Dibromofluoromethane	30.00	98.7	85 - 115	6.7	6.71	-0.0100	+/-1.000	
1,2-Dichloroethane-d4	30.00	101	70 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	100	85 - 120	9.41	9.42	-0.0100	+/-1.000	
Trip Blank #02692 (1312151-08) ug/L				Lab File ID: 1215108.D		Analyzed: 12/24/13 10:38		
Bromofluorobenzene	30.00	97.2	75 - 120	12.04	12.04	0.0000	+/-1.000	
Dibromofluoromethane	30.00	100	85 - 115	6.71	6.71	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	101	70 - 120	7.2	7.21	-0.0100	+/-1.000	
Toluene-d8	30.00	100	85 - 120	9.42	9.42	0.0000	+/-1.000	
MW-108-121813 (1312151-01) ug/L				Lab File ID: 1215101.D		Analyzed: 12/24/13 13:51		
Bromofluorobenzene	30.00	93.5	75 - 120	12.04	12.04	0.0000	+/-1.000	
Dibromofluoromethane	30.00	99.9	85 - 115	6.71	6.71	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	99.9	70 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	100	85 - 120	9.43	9.42	0.0100	+/-1.000	
MW-109-121813 (1312151-02) ug/L				Lab File ID: 1215102.D		Analyzed: 12/24/13 14:19		
Bromofluorobenzene	30.00	96.1	75 - 120	12.04	12.04	0.0000	+/-1.000	
Dibromofluoromethane	30.00	98.9	85 - 115	6.71	6.71	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	106	70 - 120	7.2	7.21	-0.0100	+/-1.000	
Toluene-d8	30.00	102	85 - 120	9.42	9.42	0.0000	+/-1.000	
MW-109S-121813 (1312151-03) ug/L				Lab File ID: 1215103.D		Analyzed: 12/24/13 14:46		
Bromofluorobenzene	30.00	96.1	75 - 120	12.03	12.04	-0.0100	+/-1.000	
Dibromofluoromethane	30.00	102	85 - 115	6.7	6.71	-0.0100	+/-1.000	
1,2-Dichloroethane-d4	30.00	99.4	70 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	98.5	85 - 120	9.42	9.42	0.0000	+/-1.000	

SURROGATE STANDARD RECOVERY AND RT SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Sequence: 3L36509
Instrument: MS-VOA6
Calibration: 3352001

Surrogate Compound	Spike Level	% Recovery	Recovery Limits	RT	CCV RT	RT Diff	RT Diff Limit	Q
MW-116-121813 (1312151-05) ug/L				Lab File ID: 1215105.D		Analyzed: 12/24/13 15:14		
Bromofluorobenzene	30.00	96.5	75 - 120	12.04	12.04	0.0000	+/-1.000	
Dibromofluoromethane	30.00	101	85 - 115	6.71	6.71	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	101	70 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	101	85 - 120	9.43	9.42	0.0100	+/-1.000	
MW-108S-121813 (1312151-04) ug/L				Lab File ID: 1215104D.D		Analyzed: 12/24/13 17:04		
Bromofluorobenzene	30.00	94.4	75 - 120	12.03	12.04	-0.0100	+/-1.000	
Dibromofluoromethane	30.00	97.4	85 - 115	6.71	6.71	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	101	70 - 120	7.2	7.21	-0.0100	+/-1.000	
Toluene-d8	30.00	100	85 - 120	9.42	9.42	0.0000	+/-1.000	

SURROGATE STANDARD RECOVERY AND RT SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Sequence: 3L36510
Instrument: MS-VOA6
Calibration: 3352001

Surrogate Compound	Spike Level	% Recovery	Recovery Limits	RT	CCV RT	RT Diff	RT Diff Limit	Q
Calibration Check (3L36510-CCV1) ug/L				Lab File ID: 1227CCV1.D		Analyzed: 12/27/13 06:17		
Bromofluorobenzene	30.00	98.4	80 - 120	12.05	12.05	0.0000	+/-1.000	
Dibromofluoromethane	30.00	98.2	80 - 120	6.72	6.72	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	101	80 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	98.9	80 - 120	9.43	9.43	0.0000	+/-1.000	
LCS (3L27001-BS1) ug/L				Lab File ID: 1227LCS1.D		Analyzed: 12/27/13 06:45		
Bromofluorobenzene	30.00	99.9	75 - 120	12.04	12.05	-0.0100	+/-1.000	
Dibromofluoromethane	30.00	95.4	85 - 115	6.72	6.72	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	102	70 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	101	85 - 120	9.43	9.43	0.0000	+/-1.000	
Blank (3L27001-BLK1) ug/L				Lab File ID: 1227BLK1.D		Analyzed: 12/27/13 08:35		
Bromofluorobenzene	30.00	95.0	75 - 120	12.04	12.05	-0.0100	+/-1.000	
Dibromofluoromethane	30.00	99.7	85 - 115	6.71	6.72	-0.0100	+/-1.000	
1,2-Dichloroethane-d4	30.00	99.0	70 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	100	85 - 120	9.43	9.43	0.0000	+/-1.000	
MW-110-121813 (1312151-06RE1) ug/L				Lab File ID: 1215106D.D		Analyzed: 12/27/13 13:38		
Bromofluorobenzene	30.00	97.6	75 - 120	12.04	12.05	-0.0100	+/-1.000	
Dibromofluoromethane	30.00	98.1	85 - 115	6.71	6.72	-0.0100	+/-1.000	
1,2-Dichloroethane-d4	30.00	108	70 - 120	7.22	7.21	0.0100	+/-1.000	
Toluene-d8	30.00	99.2	85 - 120	9.43	9.43	0.0000	+/-1.000	
FD-01-121813 (1312151-07RE1) ug/L				Lab File ID: 1215107D.D		Analyzed: 12/27/13 14:06		
Bromofluorobenzene	30.00	93.8	75 - 120	12.05	12.05	0.0000	+/-1.000	
Dibromofluoromethane	30.00	99.2	85 - 115	6.72	6.72	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	103	70 - 120	7.22	7.21	0.0100	+/-1.000	
Toluene-d8	30.00	96.9	85 - 120	9.43	9.43	0.0000	+/-1.000	

LCS / LCS DUPLICATE RECOVERY

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Matrix: Water
Batch: 3L24002
Laboratory ID: 3L24002-BS1
Preparation: 5030B
Initial/Final: 5 mL / 5 mL

ANALYTE	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC.	QC LIMITS REC.
Benzene	50.00	48.8	97.6	80 - 120
Carbon tetrachloride	50.00	42.6	85.1	65 - 140
Chloroform	50.00	40.3	80.5	65 - 135
1,2-Dichloroethane	50.00	44.3	88.6	70 - 130
cis-1,2-Dichloroethene	50.00	50.3	101	70 - 125
trans-1,2-Dichloroethene	50.00	47.8	95.5	60 - 140
Methylene chloride	50.00	44.4	88.7	55 - 140
Naphthalene	50.00	47.9	95.7	55 - 140
1,1,2,2-Tetrachloroethane	50.00	48.8	97.5	65 - 130
1,1,1,2-Tetrachloroethane	50.00	48.2	96.4	80 - 130
Tetrachloroethene	50.00	42.5	85.0	45 - 150
1,1,2-Trichloroethane	50.00	50.3	101	75 - 125
Trichloroethene	50.00	47.2	94.4	70 - 125
Vinyl chloride	50.00	59.6	119	50 - 145

LCS / LCS DUPLICATE RECOVERY

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Matrix: Water
Batch: 3L27001
Laboratory ID: 3L27001-BS1
Preparation: 5030B
Initial/Final: 5 mL / 5 mL

ANALYTE	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC.	QC LIMITS REC.
Benzene	50.00	51.7	103	80 - 120
Carbon tetrachloride	50.00	48.3	96.6	65 - 140
Chloroform	50.00	46.1	92.1	65 - 135
1,2-Dichloroethane	50.00	46.3	92.6	70 - 130
cis-1,2-Dichloroethene	50.00	52.1	104	70 - 125
trans-1,2-Dichloroethene	50.00	52.5	105	60 - 140
Methylene chloride	50.00	47.3	94.5	55 - 140
Naphthalene	50.00	51.0	102	55 - 140
1,1,2,2-Tetrachloroethane	50.00	50.1	100	65 - 130
1,1,1,2-Tetrachloroethane	50.00	51.8	104	80 - 130
Tetrachloroethene	50.00	50.4	101	45 - 150
1,1,2-Trichloroethane	50.00	52.1	104	75 - 125
Trichloroethene	50.00	49.3	98.7	70 - 125
Vinyl chloride	50.00	53.1	106	50 - 145

PREPARATION BATCH SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Batch: 3L24002 Batch Matrix: Water Preparation: 5030B

SAMPLE NAME	LAB SAMPLE ID	DATE PREPARED	INITIAL VOL /WEIGHT	FINAL VOL
MW-108-121813	1312151-01	12/24/13 13:51	5 00	5 00
MW-109-121813	1312151-02	12/24/13 14:19	5 00	5 00
MW-109S-121813	1312151-03	12/24/13 14:46	5 00	5 00
MW-108S-121813	1312151-04	12/24/13 17:04	5 00	5 00
MW-116-121813	1312151-05	12/24/13 15:14	5 00	5 00
Trip Blank #02692	1312151-08	12/24/13 10:38	5 00	5 00
Blank	3L24002-BLK1	12/24/13 09:43	5 00	5 00
LCS	3L24002-BS1	12/24/13 07:53	5 00	5 00

PREPARATION BATCH SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Batch: 3L27001 Batch Matrix: Water Preparation: 5030B

SAMPLE NAME	LAB SAMPLE ID	DATE PREPARED	INITIAL VOL /WEIGHT	FINAL VOL
MW-110-121813	1312151-06RE1	12/27/13 13:38	5 00	5 00
FD-01-121813	1312151-07RE1	12/27/13 14:06	5 00	5 00
Blank	3L27001-BLK1	12/27/13 08:35	5 00	5 00
LCS	3L27001-BS1	12/27/13 06:45	5 00	5 00

ANALYSIS DATA SHEET

Blank

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Laboratory ID: 3L24002-BLK1 File ID: 1224BLK1.D

Sampled: Prepared: Analyzed: 12/24/13 09:43

Solids: Preparation: 5030B Dilution:

Batch: 3L24002 Sequence: 3L36509 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.91	96.4	75 - 120	
Dibromofluoromethane	30.00	29.61	98.7	85 - 115	
1,2-Dichloroethane-d4	30.00	30.18	101	70 - 120	
Toluene-d8	30.00	29.99	100	85 - 120	

ANALYSIS DATA SHEET

LCS

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Laboratory ID: 3L24002-BS1 File ID: 1224LCS1.D

Sampled: Prepared: Analyzed: 12/24/13 07:53

Solids: Preparation: 5030B Dilution:

Batch: 3L24002 Sequence: 3L36509 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene	**48.8**	0.150	0.500	1.00	
56-23-5	Carbon tetrachloride	**42.6**	0.170	0.500	1.00	
67-66-3	Chloroform	**40.3**	0.170	0.500	1.00	
107-06-2	1,2-Dichloroethane	**44.3**	0.160	0.500	1.00	
156-59-2	cis-1,2-Dichloroethene	**50.3**	0.140	0.500	1.00	
156-60-5	trans-1,2-Dichloroethene	**47.8**	0.220	0.500	1.00	
75-09-2	Methylene chloride	**44.4**	0.120	1.00	2.00	
91-20-3	Naphthalene	**47.9**	0.160	0.500	1.00	
79-34-5	1,1,2,2-Tetrachloroethane	**48.8**	0.140	0.500	1.00	
630-20-6	1,1,1,2-Tetrachloroethane	**48.2**	0.150	0.500	1.00	
127-18-4	Tetrachloroethene	**42.5**	0.230	0.500	1.00	
79-00-5	1,1,2-Trichloroethane	**50.3**	0.200	0.500	1.00	
79-01-6	Trichloroethene	**47.2**	0.190	0.500	1.00	
75-01-4	Vinyl chloride	**59.6**	0.140	0.500	1.00	

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	29.75	99.2	75 - 120	
Dibromofluoromethane	30.00	29.33	97.8	85 - 115	
1,2-Dichloroethane-d4	30.00	29.09	97.0	70 - 120	
Toluene-d8	30.00	29.47	98.2	85 - 120	

ANALYSIS DATA SHEET

Blank

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Laboratory ID: 3L27001-BLK1 File ID: 1227BLK1.D

Sampled: Prepared: Analyzed: 12/27/13 08:35

Solids: Preparation: 5030B Dilution:

Batch: 3L27001 Sequence: 3L36510 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.50	95.0	75 - 120	
Dibromofluoromethane	30.00	29.92	99.7	85 - 115	
1,2-Dichloroethane-d4	30.00	29.69	99.0	70 - 120	
Toluene-d8	30.00	30.05	100	85 - 120	

ANALYSIS DATA SHEET

LCS

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Laboratory ID: 3L27001-BS1 File ID: 1227LCS1.D

Sampled: Prepared: Analyzed: 12/27/13 06:45

Solids: Preparation: 5030B Dilution:

Batch: 3L27001 Sequence: 3L36510 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene	**51.7**	0.150	0.500	1.00	
56-23-5	Carbon tetrachloride	**48.3**	0.170	0.500	1.00	
67-66-3	Chloroform	**46.1**	0.170	0.500	1.00	
107-06-2	1,2-Dichloroethane	**46.3**	0.160	0.500	1.00	
156-59-2	cis-1,2-Dichloroethene	**52.1**	0.140	0.500	1.00	
156-60-5	trans-1,2-Dichloroethene	**52.5**	0.220	0.500	1.00	
75-09-2	Methylene chloride	**47.3**	0.120	1.00	2.00	
91-20-3	Naphthalene	**51.0**	0.160	0.500	1.00	
79-34-5	1,1,2,2-Tetrachloroethane	**50.1**	0.140	0.500	1.00	
630-20-6	1,1,1,2-Tetrachloroethane	**51.8**	0.150	0.500	1.00	
127-18-4	Tetrachloroethene	**50.4**	0.230	0.500	1.00	
79-00-5	1,1,2-Trichloroethane	**52.1**	0.200	0.500	1.00	
79-01-6	Trichloroethene	**49.3**	0.190	0.500	1.00	
75-01-4	Vinyl chloride	**53.1**	0.140	0.500	1.00	

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	29.98	99.9	75 - 120	
Dibromofluoromethane	30.00	28.63	95.4	85 - 115	
1,2-Dichloroethane-d4	30.00	30.68	102	70 - 120	
Toluene-d8	30.00	30.32	101	85 - 120	

MASS SPECTROMETER INSTRUMENT PERFORMANCE CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312151
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Lab File ID:	1216TUN1.D	Injection Date:	12/16/13
Instrument ID:	MS-VOA6	Injection Time:	06:17
Sequence:	3L35205	Lab Sample ID:	3L35205-TUN1

m/z	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
50	15 - 40% of 95	28	PASS
75	30 - 60% of 95	57.3	PASS
95	Base peak, 100% relative abundance	100	PASS
96	5 - 9% of 95	6.48	PASS
173	Less than 2% of 174	0	PASS
174	50 - 200% of 95	75.9	PASS
175	5 - 9% of 174	7.36	PASS
176	95 - 101% of 174	97.5	PASS
177	5 - 9% of 176	6.33	PASS

MASS SPECTROMETER INSTRUMENT PERFORMANCE CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312151
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Lab File ID:	1224TUN1.D	Injection Date:	12/24/13
Instrument ID:	MS-VOA6	Injection Time:	06:57
Sequence:	3L36509	Lab Sample ID:	3L36509-TUN1

m/z	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
50	15 - 40% of 95	29	PASS
75	30 - 60% of 95	56.4	PASS
95	Base peak, 100% relative abundance	100	PASS
96	5 - 9% of 95	6.24	PASS
173	Less than 2% of 174	0	PASS
174	50 - 200% of 95	68.1	PASS
175	5 - 9% of 174	7.33	PASS
176	95 - 101% of 174	95.6	PASS
177	5 - 9% of 176	6.52	PASS

MASS SPECTROMETER INSTRUMENT PERFORMANCE CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312151
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Lab File ID:	1227TUN1.D	Injection Date:	12/27/13
Instrument ID:	MS-VOA6	Injection Time:	05:49
Sequence:	3L36510	Lab Sample ID:	3L36510-TUN1

m/z	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
50	15 - 40% of 95	27.3	PASS
75	30 - 60% of 95	56.1	PASS
95	Base peak, 100% relative abundance	100	PASS
96	5 - 9% of 95	6.02	PASS
173	Less than 2% of 174	0	PASS
174	50 - 200% of 95	70.3	PASS
175	5 - 9% of 174	6.63	PASS
176	95 - 101% of 174	96.8	PASS
177	5 - 9% of 176	6.25	PASS

ANALYSIS SEQUENCE SUMMARY

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312151
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	3L35205	Instrument:	MS-VOA6
Calibration:	3352001		

Sample Name	Lab Sample ID	Lab File ID	Analysis Date/Time
MS Tune	3L35205-TUN1	1216TUN1.D	12/16/13 06:17
Cal Standard	3L35205-CAL1	1216CAL1.D	12/16/13 07:39
Cal Standard	3L35205-CAL2	1216CAL2.D	12/16/13 08:07
Cal Standard	3L35205-CAL3	1216CAL3.D	12/16/13 08:35
Cal Standard	3L35205-CAL4	1216CAL4.D	12/16/13 09:02
Cal Standard	3L35205-CAL5	1216CAL5.D	12/16/13 09:30
Cal Standard	3L35205-CAL6	1216CAL6.D	12/16/13 09:57
Cal Standard	3L35205-CAL7	1216CAL7.D	12/16/13 10:25
Cal Standard	3L35205-CAL8	1216CAL8.D	12/16/13 10:52
Cal Standard	3L35205-CAL9	1216CAL9.D	12/16/13 11:20
Initial Cal Check	3L35205-ICV1	1216ICV1.D	12/16/13 12:15

ANALYSIS SEQUENCE SUMMARY

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312151
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	3L36509	Instrument:	MS-VOA6
Calibration:	3352001		

Sample Name	Lab Sample ID	Lab File ID	Analysis Date/Time
MS Tune	3L36509-TUN1	1224TUN1.D	12/24/13 06:57
Calibration Check	3L36509-CCV1	1224CCV1.D	12/24/13 07:24
LCS	3L24002-BS1	1224LCS1.D	12/24/13 07:53
Blank	3L24002-BLK1	1224BLK1.D	12/24/13 09:43
Trip Blank #02692	1312151-08	1215108.D	12/24/13 10:38
MW-108-121813	1312151-01	1215101.D	12/24/13 13:51
MW-109-121813	1312151-02	1215102.D	12/24/13 14:19
MW-109S-121813	1312151-03	1215103.D	12/24/13 14:46
MW-116-121813	1312151-05	1215105.D	12/24/13 15:14
MW-108S-121813	1312151-04	1215104D.D	12/24/13 17:04

ANALYSIS SEQUENCE SUMMARY

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312151
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	3L36510	Instrument:	MS-VOA6
Calibration:	3352001		

Sample Name	Lab Sample ID	Lab File ID	Analysis Date/Time
MS Tune	3L36510-TUN1	1227TUN1.D	12/27/13 05:49
Calibration Check	3L36510-CCV1	1227CCV1.D	12/27/13 06:17
LCS	3L27001-BS1	1227LCS1.D	12/27/13 06:45
Blank	3L27001-BLK1	1227BLK1.D	12/27/13 08:35
MW-110-121813	1312151-06RE1	1215106D.D	12/27/13 13:38
FD-01-121813	1312151-07RE1	1215107D.D	12/27/13 14:06

INTERNAL STANDARD AREA AND RT SUMMARY
SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Sequence: 3L36509
Instrument: MS-VOA6
Calibration: 3352001

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Calibration Check (3L36509-CCV1)			Lab File ID: 1224CCV1.D			Analyzed: 12/24/13 07:24			
Fluorobenzene	1239958	7.73	985038	7.76	126	50 - 200	-0.0300	+/-0.50	
Chlorobenzene-d5	580958	10.84	457662	10.87	127	50 - 200	-0.0300	+/-0.50	
1,4-Dichlorobenzene-d4	531746	13.24	401927	13.25	132	50 - 200	-0.0100	+/-0.50	
LCS (3L24002-BS1)			Lab File ID: 1224LCS1.D			Analyzed: 12/24/13 07:53			
Fluorobenzene	1252991	7.74	985038	7.73	127	50 - 200	0.0100	+/-0.50	
Chlorobenzene-d5	587981	10.85	457662	10.84	128	50 - 200	0.0100	+/-0.50	
1,4-Dichlorobenzene-d4	515458	13.23	401927	13.24	128	50 - 200	-0.0100	+/-0.50	
Blank (3L24002-BLK1)			Lab File ID: 1224BLK1.D			Analyzed: 12/24/13 09:43			
Fluorobenzene	1095224	7.73	985038	7.73	111	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	501877	10.84	457662	10.84	110	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	406421	13.24	401927	13.24	101	50 - 200	0.0000	+/-0.50	
Trip Blank #02692 (1312151-08)			Lab File ID: 1215108.D			Analyzed: 12/24/13 10:38			
Fluorobenzene	1075781	7.73	985038	7.73	109	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	496872	10.85	457662	10.84	109	50 - 200	0.0100	+/-0.50	
1,4-Dichlorobenzene-d4	398451	13.23	401927	13.24	99	50 - 200	-0.0100	+/-0.50	
MW-108-121813 (1312151-01)			Lab File ID: 1215101.D			Analyzed: 12/24/13 13:51			
Fluorobenzene	1081245	7.73	985038	7.73	110	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	500002	10.84	457662	10.84	109	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	397689	13.24	401927	13.24	99	50 - 200	0.0000	+/-0.50	
MW-109-121813 (1312151-02)			Lab File ID: 1215102.D			Analyzed: 12/24/13 14:19			
Fluorobenzene	1061043	7.73	985038	7.73	108	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	482348	10.85	457662	10.84	105	50 - 200	0.0100	+/-0.50	
1,4-Dichlorobenzene-d4	392522	13.23	401927	13.24	98	50 - 200	-0.0100	+/-0.50	
MW-109S-121813 (1312151-03)			Lab File ID: 1215103.D			Analyzed: 12/24/13 14:46			
Fluorobenzene	1059961	7.73	985038	7.73	108	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	498579	10.84	457662	10.84	109	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	391840	13.24	401927	13.24	97	50 - 200	0.0000	+/-0.50	
MW-116-121813 (1312151-05)			Lab File ID: 1215105.D			Analyzed: 12/24/13 15:14			
Fluorobenzene	1034677	7.73	985038	7.73	105	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	482025	10.84	457662	10.84	105	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	390076	13.24	401927	13.24	97	50 - 200	0.0000	+/-0.50	
MW-108S-121813 (1312151-04)			Lab File ID: 1215104D.D			Analyzed: 12/24/13 17:04			
Fluorobenzene	1055562	7.74	985038	7.73	107	50 - 200	0.0100	+/-0.50	
Chlorobenzene-d5	482738	10.85	457662	10.84	105	50 - 200	0.0100	+/-0.50	
1,4-Dichlorobenzene-d4	391032	13.23	401927	13.24	97	50 - 200	-0.0100	+/-0.50	

INTERNAL STANDARD AREA AND RT SUMMARY
SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312151
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	3L36510	Instrument:	MS-VOA6
		Calibration:	3352001

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Calibration Check (3L36510-CCV1)			Lab File ID: 1227CCV1.D			Analyzed: 12/27/13 06:17			
Fluorobenzene	1248304	7.74	985038	7.76	127	50 - 200	-0.0200	+/-0.50	
Chlorobenzene-d5	601060	10.85	457662	10.87	131	50 - 200	-0.0200	+/-0.50	
1,4-Dichlorobenzene-d4	538001	13.24	401927	13.25	134	50 - 200	-0.0100	+/-0.50	
LCS (3L27001-BS1)			Lab File ID: 1227LCS1.D			Analyzed: 12/27/13 06:45			
Fluorobenzene	1289812	7.74	985038	7.74	131	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	593098	10.85	457662	10.85	130	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	547198	13.24	401927	13.24	136	50 - 200	0.0000	+/-0.50	
Blank (3L27001-BLK1)			Lab File ID: 1227BLK1.D			Analyzed: 12/27/13 08:35			
Fluorobenzene	1120821	7.74	985038	7.74	114	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	516328	10.85	457662	10.85	113	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	387986	13.24	401927	13.24	97	50 - 200	0.0000	+/-0.50	
MW-110-121813 (1312151-06RE1)			Lab File ID: 1215106D.D			Analyzed: 12/27/13 13:38			
Fluorobenzene	1067201	7.74	985038	7.74	108	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	492482	10.85	457662	10.85	108	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	399340	13.25	401927	13.24	99	50 - 200	0.0100	+/-0.50	
FD-01-121813 (1312151-07RE1)			Lab File ID: 1215107D.D			Analyzed: 12/27/13 14:06			
Fluorobenzene	1045188	7.74	985038	7.74	106	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	497647	10.85	457662	10.85	109	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	387856	13.24	401927	13.24	96	50 - 200	0.0000	+/-0.50	

Note: As indicated by QSM 4.2 table F-4, internal standard retention times are evaluated to the continuing calibration verification rather than the midpoint of the initial calibration curve. Reference DoD QSM F-4 tables for RTW establishment: "Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used." and the following page for technical explanation on the use of daily CCV retention times in lieu of the ICAL midpoint standard: "Laboratories may update the retention times based on the CCV to account for minor performance fluctuations or after routine system maintenance (such as column clipping).

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Acetone	1	~~0.3288185~~	2	0.2220273	4	0.1623286	10	0.1481551	20	0.1274897	100	0.1233507
Acetonitrile	5	5.602495E-02	10	4.919139E-02	20	3.879023E-02	50	4.228191E-02	100	3.906914E-02	500	3.957251E-02
Acrolein	2.5	~~5.492273E-02~~	5	3.727502E-02	10	3.186782E-02	25	0.0315535	50	3.491343E-02	250	3.657385E-02
Acrylonitrile	2.5	0.1327456	5	0.1091826	10	0.10551	25	0.1111542	50	0.1039141	250	0.104849
Benzene	0.5	1.001792	1	0.8997419	2	0.9567685	5	0.9800019	10	0.9857401	50	1.041908
Allyl chloride	0.5	0.1290039	1	0.1213898	2	0.1221582	5	0.1235948	10	0.1223193	50	0.1312837
Bromobenzene	0.5	0.8259444	1	0.71856	2	0.7825523	5	0.8274245	10	0.7849139	50	0.8543822
Bromochloromethane	0.5	0.1729479	1	0.1412803	2	0.1584977	5	0.1602483	10	0.1606515	50	0.1742235
Tert-Amyl Methyl Ether	0.5	0.7530665	1	0.6342354	2	0.6689521	5	0.751513	10	0.7494703	50	0.8221681
Bromodichloromethane	0.5	0.4455311	1	0.4058173	2	0.4182092	5	0.4424072	10	0.4469204	50	0.4848844
Bromoform	0.5	0.2992146	1	0.2922096	2	0.3315837	5	0.3806187	10	0.3749049	50	0.4651812
Bromomethane	0.5	0.3337857	1	0.2620238	2	0.2305324	5	0.2638356	10	0.2480899	50	0.237613
Bromofluorobenzene	30	0.9571981	35	0.9655349	40	0.9710133	50	0.982005	60	0.9884479	70	0.9764452
n-Butylbenzene	0.5	1.63077	1	1.530071	2	1.623714	5	1.842372	10	1.927617	50	2.194212
2-Butanone	1	0.1769362	2	0.1475096	4	0.150836	10	0.1426553	20	0.1441023	100	0.148134
sec-Butylbenzene	0.5	2.636033	1	2.256345	2	2.503791	5	2.75357	10	2.930176	50	3.220494
tert-Butylbenzene	0.5	2.127834	1	1.88197	2	2.156601	5	2.359505	10	2.423421	50	2.655347
Carbon disulfide	0.5	0.8624913	1	0.6883061	2	0.764688	5	0.8074891	10	0.8392042	50	0.9107136
Carbon tetrachloride	0.5	0.4284176	1	0.4257079	2	0.4556586	5	0.4740362	10	0.4678455	50	0.5254643
Chlorobenzene	0.5	1.836998	1	1.53932	2	1.674058	5	1.728988	10	1.653791	50	1.774433
Chloroethane	0.5	0.2242158	1	0.1822821	2	0.1660879	5	0.1958606	10	0.1872501	50	0.1878772
Chloroform	0.5	0.7843929	1	0.5799134	2	0.5963625	5	0.6112162	10	0.5784279	50	0.612751
2-Chloroethyl vinyl ether	1	8.099906E-02	2	7.333291E-02	4	8.531739E-02	10	8.280067E-02	20	7.014801E-02	100	7.348515E-02
Chloromethane	0.5	0.4477065	1	0.3323947	2	0.313451	5	0.3592467	10	0.3601449	50	0.3735497
1-Chlorohexane	0.5	0.9288087	1	0.7096853	2	0.6703928	5	0.7042292	10	0.6803893	50	0.7401774
2-Chlorotoluene	0.5	2.297746	1	2.004349	2	2.363496	5	2.400817	10	2.368955	50	2.535951
Chloroprene	0.5	0.6499504	1	0.5868428	2	0.5701908	5	0.6287847	10	0.6589835	50	0.6944669
4-Chlorotoluene	0.5	2.833016	1	2.302249	2	2.627214	5	2.782515	10	2.804322	50	2.97795
Cyclohexane	0.5	0.4220363	1	0.3535059	2	0.3953851	5	0.4415826	10	0.4476266	50	0.4864473
Dibromochloromethane	0.5	0.7035714	1	0.5561912	2	0.6191473	5	0.6766387	10	0.7061886	50	0.7994532
1,2-Dibromo-3-chloropropane	0.5	~~0.1332416~~	1	7.209409E-02	2	0.1074893	5	0.126289	10	0.1173174	50	0.1521664

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
1,2-Dibromoethane (EDB)	0.5	0.6341586	1	0.5156088	2	0.5772478	5	0.6427509	10	0.6161028	50	0.6577304
Dibromomethane	0.5	0.2421995	1	0.1854057	2	0.2130608	5	0.2190477	10	0.2085717	50	0.2175011
1,2-Dichlorobenzene	0.5	1.407292	1	1.184648	2	1.351536	5	1.422387	10	1.369617	50	1.513227
1,3-Dichlorobenzene	0.5	1.428795	1	1.432168	2	1.427206	5	1.480065	10	1.499029	50	1.567131
trans-1,4-Dichloro-2-butene	0.5	~~0.2676352~~	1	0.2518055	2	0.3127859	5	0.3502759	10	0.3212036	50	0.3811003
cis-1,4-Dichloro-2-butene	0.5	0.3198566	1	0.3155188	2	0.3168749	5	0.3477989	10	0.3507495	50	0.4043255
1,4-Dichlorobenzene	0.5	1.707374	1	1.367026	2	1.454231	5	1.524296	10	1.519416	50	1.597998
Dichlorodifluoromethane	0.5	0.4704762	1	0.3875424	2	0.3951523	5	0.3825526	10	0.4779366	50	0.4882398
1,1-Dichloroethane	0.5	0.6215971	1	0.5148204	2	0.5539186	5	0.5739058	10	0.5604445	50	0.5789404
1,2-Dichloroethane	0.5	0.6977377	1	0.6492072	2	0.7149046	5	0.7101144	10	0.67133	50	0.691011
1,1-Dichloroethene	0.5	0.2675797	1	0.2221709	2	0.2395009	5	0.2447506	10	0.2557957	50	0.2570837
cis-1,2-Dichloroethene	0.5	0.2432872	1	0.2485959	2	0.2681966	5	0.2855692	10	0.2791828	50	0.2906336
trans-1,2-Dichloroethene	0.5	0.2581528	1	0.2446824	2	0.2374065	5	0.263039	10	0.2572849	50	0.2639993
1,2-Dichloroethene (total)	1	0.25072	2	0.2466391	4	0.2528015	10	0.2743041	20	0.2682338	100	0.2773164
1,2-Dichloropropane	0.5	0.266347	1	0.2328701	2	0.2608034	5	0.2741643	10	0.267286	50	0.2905274
1,3-Dichloropropane	0.5	0.8342121	1	0.8839789	2	0.9185308	5	0.9486775	10	0.9342751	50	0.9912243
2,2-Dichloropropane	0.5	0.4529276	1	0.4296573	2	0.4538864	5	0.489089	10	0.4749316	50	0.5172111
1,1-Dichloropropene	0.5	0.4012245	1	0.3583529	2	0.392503	5	0.4229588	10	0.424626	50	0.4528363
cis-1,3-Dichloropropene	0.5	0.359601	1	0.3314971	2	0.3875622	5	0.4071793	10	0.4238631	50	0.477862
trans-1,3-Dichloropropene	0.5	0.8971715	1	0.7819362	2	0.9491996	5	0.9869749	10	0.9862184	50	1.126627
Diisopropyl Ether	0.5	1.024054	1	0.9017525	2	0.9641796	5	1.040038	10	1.039067	50	1.112964
1,4-Dioxane	10	2.008661E-03	20	2.044705E-03	40	2.336114E-03	100	2.522071E-03	200	2.143985E-03	1000	2.652047E-03
Ethylbenzene	0.5	2.471944	1	2.214522	2	2.434572	5	2.684476	10	2.758637	50	2.957095
Ethyl tert-Butyl Ether	0.5	0.963577	1	0.8655258	2	0.9727006	5	1.049249	10	1.01616	50	1.116396
Ethyl Methacrylate	0.5	0.6280201	1	0.5561912	2	0.639135	5	0.7033684	10	0.696696	50	0.7859386
Hexachlorobutadiene	0.5	0.5563893	1	0.5156109	2	0.5323706	5	0.5419032	10	0.5247702	50	0.5732651
Hexane	0.5	0.2049994	1	0.196464	2	0.2098027	5	0.2321438	10	0.2439422	50	0.2540686
2-Hexanone	1	0.3953851	2	0.3723189	4	0.3950613	10	0.4464009	20	0.428934	100	0.463153
Iodomethane	0.5	0.3519145	1	0.3424476	2	0.3514375	5	0.3883598	10	0.4235499	50	0.4924456
Isobutyl alcohol	10	6.261655E-03	20	4.24918E-03	40	5.220006E-03	100	5.682173E-03	200	4.898134E-03	1000	5.645641E-03
Isopropylbenzene	0.5	~~2.013914~~	1	1.823319	2	2.181329	5	2.425183	10	2.470393	50	2.749678

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
p-Isopropyltoluene	0.5	2.414284	1	2.089967	2	2.245291	5	2.501381	10	2.570049	50	2.827357
Methacrylonitrile	5	0.22497	10	0.1930065	20	0.2089327	50	0.2237446	100	0.2139761	500	0.2226564
Methylene chloride	0.5	~~0.5828017~~	1	0.3491975	2	0.3288461	5	0.3273941	10	0.2845865	50	0.2872668
Methyl Acetate	0.5	~~0.3857064~~	1	0.3154482	2	0.2903226	5	0.3030329	10	0.2601533	50	0.2434809
Methylcyclohexane	0.5	0.3221109	1	0.2744823	2	0.2967133	5	0.3184141	10	0.3366445	50	0.3560554
Naphthalene	0.5	1.396541	1	1.309217	2	1.336731	5	1.444397	10	1.584445	50	1.887839
Methyl Methacrylate	0.5	0.3092757	1	0.2915724	2	0.3034442	5	0.324452	10	0.3110086	50	0.3413477
4-Methyl-2-pentanone	1	0.2646066	2	0.252653	4	0.2816047	10	0.3064083	20	0.2857459	100	0.309209
Methyl t-Butyl Ether	0.5	0.7599554	1	0.7730025	2	0.7712577	5	0.8224021	10	0.7764854	50	0.8366818
n-Propylbenzene	0.5	3.205478	1	2.985857	2	3.16137	5	3.395684	10	3.540615	50	3.815046
Propionitrile	5	3.860689E-02	10	3.631281E-02	20	3.519208E-02	50	3.953202E-02	100	3.526257E-02	500	3.705665E-02
Styrene	0.5	1.294131	1	1.170637	2	1.364739	5	1.573669	10	1.623073	50	1.83601
1,1,2,2-Tetrachloroethane	0.5	0.7764107	1	0.665799	2	0.7153891	5	0.7611308	10	0.7028783	50	0.7666392
1,1,1,2-Tetrachloroethane	0.5	0.6226685	1	0.562134	2	0.5591843	5	0.6168669	10	0.6211794	50	0.6923942
tert-Butyl alcohol	2.5	3.176149E-02	5	2.457954E-02	10	2.613583E-02	25	2.906846E-02	50	0.0246684	250	0.0253521
Tetrachloroethene	0.5	0.5831615	1	0.531873	2	0.5567103	5	0.5878116	10	0.6088291	50	0.6332623
Toluene	0.5	1.412809	1	1.197301	2	1.319581	5	1.380792	10	1.36182	50	1.44104
1,2,3-Trichlorobenzene	0.5	0.7666192	1	0.5883716	2	0.6407529	5	0.6965532	10	0.7155865	50	0.8062701
1,2,4-Trichlorobenzene	0.5	0.854359	1	0.6807511	2	0.676849	5	0.7072572	10	0.7758474	50	0.8834649
1,1,2-Trichloroethane	0.5	0.3890891	1	0.3958161	2	0.4014425	5	0.4122413	10	0.4019966	50	0.4322855
1,1,1-Trichloroethane	0.5	0.5217442	1	0.4704436	2	0.5074111	5	0.5415151	10	0.5462556	50	0.5666079
Tetrahydrofuran	0.5	1.841877E-02	1	2.506065E-02	2	2.459633E-02	5	2.873582E-02	10	2.212781E-02	50	2.689194E-02
Trichloroethene	0.5	0.2818651	1	0.2674811	2	0.2987899	5	0.3121037	10	0.3107088	50	0.3225856
Trichlorofluoromethane	0.5	0.6398708	1	0.5539193	2	0.5702624	5	0.5984556	10	0.6218806	50	0.6265427
1,2,3-Trichloropropane	0.5	0.1660554	1	0.2371613	2	0.2524576	5	0.2528296	10	0.2191469	50	0.2367786
1,3,5-Trimethylbenzene	0.5	2.30005	1	2.177489	2	2.526539	5	2.600353	10	2.69682	50	2.870595
1,2,4-Trimethylbenzene	0.5	2.253204	1	1.995397	2	2.275653	5	2.6207	10	2.67682	50	2.908348
1,1,2-Trichloro-1,2,2-trifluoroethan	0.5	0.3112336	1	0.2766365	2	0.2852565	5	0.3025787	10	0.3143801	50	0.3104713
Vinyl chloride	0.5	0.3408922	1	0.2999738	2	0.310551	5	0.3231103	10	0.3283657	50	0.3495405
m,p-Xylene	1	2.246943	2	1.869453	4	2.121209	10	2.292826	20	2.219465	100	2.419415
o-Xylene	0.5	2.076086	1	1.943112	2	2.221894	5	2.375454	10	2.334007	50	2.506241

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Vinyl acetate	1	0.7117693	2	0.6064282	4	0.6582203	10	0.7077768	20	0.6245841	100	0.7046624
Xylenes (total)	1.5	2.189991	3	1.894006	6	2.15477	15	2.320369	30	2.257646	150	2.448357
Dibromofluoromethane	30	0.3511555	35	0.3518626	40	0.348243	50	0.3572767	60	0.3526151	70	0.3506151
1,2-Dichloroethane-d4	30	6.416354E-02	35	6.463041E-02	40	6.380276E-02	50	6.416572E-02	60	6.290977E-02	70	6.569801E-02
Toluene-d8	30	2.080908	35	2.05466	40	2.096888	50	2.098553	60	2.104103	70	2.099524
tert-Amyl alcohol	2.5	1.535864E-02	5	1.235799E-02	10	1.185063E-02	25	1.453703E-02	50	1.333665E-02	250	1.598225E-02
tert-Amyl ethyl ether	0.5	0.7149237	1	0.6502484	2	0.6871218	5	0.7644553	10	0.7736503	50	0.8430522
1,3,5-Trichlorobenzene	0.5	0.9123402	1	0.7463691	2	0.8448275	5	0.8628449	10	0.8558897	50	0.9772468
Diethyl ether	0.5	0.264099	1	0.211723	2	0.2517096	5	0.2439819	10	0.2473803	50	0.245608

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Acetone	200	0 1223536	300	0 1242457	400	0 1203613						
Acetonitrile	1000	4 048689E-02	1500	4 303058E-02	2000	4 536802E-02						
Acrolein	500	3 837757E-02	750	3 912383E-02	1000	4 368877E-02						
Acrylonitrile	500	0 1058304	750	0 1103694	1000	0 1157639						
Benzene	100	1 045684	150	1 069117	200	1 100555						
Allyl chloride	100	0 1301861	150	0 1353574	200	0 1344522						
Bromobenzene	100	0 8347792	150	0 8609046	200	0 8587283						
Bromochloromethane	100	0 1721562	150	0 1718145	200	0 1726678						
Tert-Amyl Methyl Ether	100	0 8485488	150	0 8724162	200	0 8822091						
Bromodichloromethane	100	0 4857391	150	0 4830007	200	0 4777352						
Bromoform	100	0 4940723	150	0 5233153	200	0 5206683						
Bromomethane	100	0 2458489	150	0 2511362	200	0 2472115						
Bromofluorobenzene	30	0 954001	30	0 9524235	30	0 9466962						
n-Butylbenzene	100	2 195223	150	2 239683	200	2 210941						
2-Butanone	200	0 1517842	300	0 1519968	400	0 1574109						
sec-Butylbenzene	100	3 141262	150	3 247052	200	3 0715						
tert-Butylbenzene	100	2 599745	150	2 678873	200	2 649429						
Carbon disulfide	100	0 8828894	150	0 941503	200	0 9613434						
Carbon tetrachloride	100	0 5002427	150	0 5065613	200	0 4899897						
Chlorobenzene	100	1 78377	150	1 890187	200	1 876812						
Chloroethane	100	0 1983627	150	0 2050283	200	0 2033424						
Chloroform	100	0 5957633	150	0 5961112	200	0 5820782						
2-Chloroethyl vinyl ether	200	7 136481E-02	300	8 930096E-02	400	8 148637E-02						
Chloromethane	100	0 3895644	150	0 3950223	200	0 3922326						
1-Chlorohexane	100	0 7278216	150	0 7782844	200	0 7752522						
2-Chlorotoluene	100	2 46575	150	2 534251	200	2 433013						
Chloroprene	100	0 6591449	150	0 6663138	200	0 6694291						
4-Chlorotoluene	100	2 921919	150	2 95303	200	2 872079						
Cyclohexane	100	0 4510599	150	0 477335	200	0 495946						
Dibromochloromethane	100	0 8234533	150	0 8620765	200	0 8459628						
1,2-Dibromo-3-chloropropane	100	0 1596723	150	0 1658598	200	0 173507						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
1,2-Dibromoethane (EDB)	100	0 663114	150	0 6958268	200	0 6866003						
Dibromomethane	100	0 2167777	150	0 2146884	200	0 2170703						
1,2-Dichlorobenzene	100	1 513378	150	1 558144	200	1 528831						
1,3-Dichlorobenzene	100	1 564907	150	1 579102	200	1 598892						
trans-1,4-Dichloro-2-butene	100	0 3797488	150	0 3968828	200	0 3748107						
cis-1,4-Dichloro-2-butene	100	0 4071157	150	0 4301267	200	0 4068888						
1,4-Dichlorobenzene	100	1 591644	150	1 624969	200	1 62976						
Dichlorodifluoromethane	100	0 4434886	150	0 4398639	200	0 4336788						
1,1-Dichloroethane	100	0 5680167	150	0 576059	200	0 5821218						
1,2-Dichloroethane	100	0 6743237	150	0 6614162	200	0 6371142						
1,1-Dichloroethene	100	0 2497366	150	0 2631636	200	0 2638804						
cis-1,2-Dichloroethene	100	0 2899578	150	0 2937441	200	0 2938337						
trans-1,2-Dichloroethene	100	0 2577781	150	0 2655436	200	0 2695976						
1,2-Dichloroethene (total)	200	0 273868	300	0 2796439	400	0 2817156						
1,2-Dichloropropane	100	0 2951371	150	0 3028902	200	0 303376						
1,3-Dichloropropane	100	0 9828179	150	1 01845	200	1 021113						
2,2-Dichloropropane	100	0 4978559	150	0 5065538	200	0 4904188						
1,1-Dichloropropene	100	0 4292606	150	0 4402576	200	0 4435662						
cis-1,3-Dichloropropene	100	0 4898485	150	0 4880797	200	0 4936149						
trans-1,3-Dichloropropene	100	1 157612	150	1 20862	200	1 188933						
Diisopropyl Ether	100	1 111236	150	1 135147	200	1 153771						
1,4-Dioxane	2000	2 79041E-03	3000	2 808772E-03	4000	2 95784E-03						
Ethylbenzene	100	2 972394	150	3 127638	200	2 970953						
Ethyl tert-Butyl Ether	100	1 11604	150	1 124914	200	1 132971						
Ethyl Methacrylate	100	0 8139891	150	0 8582517	200	~~0 889472~~						
Hexachlorobutadiene	100	0 5576849	150	0 5798926	200	0 5687879						
Hexane	100	0 2336751	150	0 2502461	200	0 2584357						
2-Hexanone	200	0 4644608	300	0 5025928	400	0 5090106						
Iodomethane	100	0 4981459	150	0 5237961	200	0 5335033						
Isobutyl alcohol	2000	5 873728E-03	3000	6 344857E-03	4000	6 877599E-03						
Isopropylbenzene	100	2 688822	150	2 860662	200	2 784206						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
p-Isopropyltoluene	100	2 802304	150	2 871013	200	2 800058						
Methacrylonitrile	1000	0 223612	1500	0 2295319	2000	0 2297651						
Methylene chloride	100	0 2815487	150	0 2842341	200	0 289209						
Methyl Acetate	100	0 2417526	150	0 2459678	200	0 2563304						
Methylcyclohexane	100	0 329101	150	0 3514488	200	0 3631279						
Naphthalene	100	2 104761	150	2 135807	200	2 27305						
Methyl Methacrylate	100	0 3472788	150	0 3568722	200	0 3612607						
4-Methyl-2-pentanone	200	0 31566	300	0 3235698	400	0 3336355						
Methyl t-Butyl Ether	100	0 8371678	150	0 8593533	200	0 8713245						
n-Propylbenzene	100	3 747354	150	3 8915	200	3 449316						
Propionitrile	1000	3 713059E-02	1500	3 857757E-02	2000	4 502207E-02						
Styrene	100	1 875727	150	1 962025	200	1 989463						
1,1,2,2-Tetrachloroethane	100	0 7527225	150	0 7735203	200	0 7847629						
1,1,1,2-Tetrachloroethane	100	0 7042877	150	0 7302072	200	0 7187477						
tert-Butyl alcohol	500	2 495374E-02	750	2 620211E-02	1000	2 588372E-02						
Tetrachloroethene	100	0 6199359	150	0 661779	200	0 6570152						
Toluene	100	1 470023	150	1 534846	200	1 566377						
1,2,3-Trichlorobenzene	100	0 8351867	150	0 854558	200	0 8671405						
1,2,4-Trichlorobenzene	100	0 9129762	150	0 9340574	200	0 9307971						
1,1,2-Trichloroethane	100	0 4319802	150	0 4566432	200	0 458466						
1,1,1-Trichloroethane	100	0 5293447	150	0 5396075	200	0 5219224						
Tetrahydrofuran	100	2 769061E-02	150	2 782133E-02	200	2 897638E-02						
Trichloroethene	100	0 3174289	150	0 3209899	200	0 3173508						
Trichlorofluoromethane	100	0 5773918	150	0 5890049	200	0 5715509						
1,2,3-Trichloropropane	100	0 2312847	150	0 2404587	200	0 2354357						
1,3,5-Trimethylbenzene	100	2 832287	150	2 864537	200	2 798373						
1,2,4-Trimethylbenzene	100	2 889999	150	2 913238	200	2 90222						
1,1,2-Trichloro-1,2,2-trifluoroethan	100	0 2862736	150	0 2997365	200	0 3023734						
Vinyl chloride	100	0 3502053	150	0 3647242	200	0 3559123						
m,p-Xylene	200	2 452378	300	2 344619	400	1 965535						
o-Xylene	100	2 535753	150	2 586349	200	2 602022						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Vinyl acetate	200	0 7176122	300	0 7803305	400	0 784598						
Xylenes (total)	300	2 480169	450	2 425196	600	2 177697						
Dibromofluoromethane	30	0 3394245	30	0 3340694	30	0 3306909						
1,2-Dichloroethane-d4	30	6 086263E-02	30	6 184593E-02	30	6 174716E-02						
Toluene-d8	30	2 101308	30	2 130443	30	2 130386						
tert-Amyl alcohol	500	0 0167918	750	1 784867E-02	1000	1 918408E-02						
tert-Amyl ethyl ether	100	0 855408	150	0 8698864	200	0 8717509						
1,3,5-Trichlorobenzene	100	0 9946224	150	1 015757	200	1 01148						
Diethyl ether	100	0 2546247	150	0 2726478	200	0 2723049						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
Acetone	0 143789	24 31662	3 59125	0 1787929	0 999671		0 995	
Acetonitrile	4 375729E-02	13 03298	3 666667	0 5783599			15	
Acrolein	3 667172E-02	10 85392	3 475	0 1539715			15	
Acrylonitrile	0 1110355	8 081635	4 42	0 1595104			15	
Benzene	1 009034	6 121714	7 485555	7 189717E-02			15	
Allyl chloride	0 1277495	4 298736	4 487778	9 646297E-02			15	
Bromobenzene	0 8164655	5 724375	12 21778	3 150273E-02			15	
Bromochloromethane	0 1649431	6 610323	6 578889	4 857425E-02			15	
Tert-Amyl Methyl Ether	0 7758422	11 2879	7 685556	0 0694881			15	
Bromodichloromethane	0 4544716	6 611337	8 474444	6 333754E-02			15	
Bromoform	0 4090854	22 79818	11 62444	4 373709E-02		0 9995946	SPCC (0 1)	
Bromomethane	0 2577863	11 77635	2 671111	0 1253754			15	
Bromofluorobenzene	0 9659739	1 497042	12 05778	2 916133E-02			15	
n-Butylbenzene	1 932734	14 92743	13 64556	3 968718E-02			15	
2-Butanone	0 1523739	6 709003	6 051111	5 124335E-02			15	
sec-Butylbenzene	2 862247	12 11066	13 10556	3 988223E-02			15	
tert-Butylbenzene	2 392525	11 89966	12 87667	4 356942E-02			15	
Carbon disulfide	0 8509587	10 26425	4 571111	7 083462E-02			15	
Carbon tetrachloride	0 4748804	7 229955	7 452222	6 084384E-02			15	
Chlorobenzene	1 750929	6 53941	10 90222	3 945996E-02			SPCC (0 3)	
Chloroethane	0 1944786	8 41338	2 8	9 061371E-03			15	
Chloroform	0 6152241	10 50876	6 554445	8 215545E-02			CCC (30)	
2-Chloroethyl vinyl ether	7 869282E-02	8 630171	8 84	5 305915E-02			15	
Chloromethane	0 3737014	10 47359	2 102222	0 2083576			SPCC (0 1)	
1-Chlorohexane	0 7461157	10 46423	10 87667	4 793572E-02			15	
2-Chlorotoluene	2 378259	6 762953	12 43556	4 278261E-02			15	
Chloroprene	0 6426785	6 29916	5 85	8 738947E-02			15	
4-Chlorotoluene	2 786033	7 533473	12 50222	3 551636E-02			15	
Cyclohexane	0 4412139	10 33837	7 381111	4 442025E-02			15	
Dibromochloromethane	0 7325203	14 56001	10 14	5 259225E-02			15	
1,2-Dibromo-3-chloropropane	0 1342994	25 85084	14 24125	1 845794E-02		0 9999589	0 99	
1,2-Dibromoethane (EDB)	0 6321267	8 949404	10 34889	2 811125E-02			15	

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
Dibromomethane	0 2149248	6 764273	8 405555	5 955256E-02			15	
1,2-Dichlorobenzene	1 427673	8 235468	13 60111	1 929657E-02			15	
1,3-Dichlorobenzene	1 508588	4 655512	13 19333	3 685081E-02			15	
trans-1,4-Dichloro-2-butene	0 3460767	13 9858	12 02125	2 376142E-02			15	
cis-1,4-Dichloro-2-butene	0 3665839	12 42429	11 70889	2 758372E-02			15	
1,4-Dichlorobenzene	1 557413	6 600556	13 28222	3 724333E-02			15	
Dichlorodifluoromethane	0 4354368	9 122488	1 902222	0 2317774			15	
1,1-Dichloroethane	0 5699805	4 9389	5 59	1 317553E-02			SPCC (0 1)	
1,2-Dichloroethane	0 6785732	3 962158	7 318889	4 316269E-02			15	
1,1-Dichloroethene	0 251518	5 710461	4 04	0 0136054			CCC (30)	
cis-1,2-Dichloroethene	0 2770001	7 01021	6 301111	0 1244704			15	
trans-1,2-Dichloroethene	0 2574982	4 009072	5 204444	0 1000304			15	
1,2-Dichloroethene (total)	0 2672492	5 064489	6 301111	0 1244704			15	
1,2-Dichloropropane	0 2770446	8 371838	8 297778	4 797973E-02			CCC (30)	
1,3-Dichloropropane	0 9481422	6 617396	9 883334	4 963371E-02			15	
2,2-Dichloropropane	0 4791702	5 979964	6 406667	7 735277E-02			15	
1,1-Dichloropropene	0 4183984	7 092991	7 333333	6 658381E-02			15	
cis-1,3-Dichloropropene	0 4287898	14 35212	9 045556	5 672472E-02			15	
trans-1,3-Dichloropropene	1 031477	14 22543	9 521111	3 532554E-02			15	
Diisopropyl Ether	1 053579	7 930613	5 972222	7 036451E-02			15	
1,4-Dioxane	2 473845E-03	14 35623	8 46	6 046944E-02			15	
Ethylbenzene	2 73247	11 19746	11 05	4 248291E-02			CCC (30)	
Ethyl tert-Butyl Ether	1 039726	8 928137	6 436667	7 972155E-02			15	
Ethyl Methacrylate	0 7101988	14 49481	9 71375	5 660601E-02			15	
Hexachlorobutadiene	0 550075	4 107061	15 60111	2 482048E-02			15	
Hexane	0 2315308	9 833396	5 795556	9 331608E-02			15	
2-Hexanone	0 4419242	10 89205	9 825555	0 0546362			15	
Iodomethane	0 4339556	18 14902	4 233333	0 1187631		0 9999163	0 99	
Isobutyl alcohol	5 672553E-03	14 10708	6 668889	0 1166975			15	
Isopropylbenzene	2 497949	14 15158	11 94875	2 108918E-02			15	
p-Isopropyltoluene	2 569078	10 91057	13 24333	3 673612E-02			15	
Methacrylonitrile	0 2189106	5 409314	6 221111	0 2473932			15	

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
Methylene chloride	0 3040354	8 770955	4 5325	0 103154			15	
Methyl Acetate	0 2695611	10 7981	4 40625	0 1179939			15	
Methylcyclohexane	0 3275665	8 778339	8 62	0 0571821			15	
Naphthalene	1 719199	22 24028	15 46556	3 240156E-02		0 9997636	0 99	
Methyl Methacrylate	0 3273903	7 688068	8 436666	0 0549356			15	
4-Methyl-2-pentanone	0 2970103	9 231002	8 977777	4 607543E-02			15	
Methyl t-Butyl Ether	0 8119589	5 200309	5 214444	0 1008507			15	
n-Propylbenzene	3 465802	9 032782	12 35556	4 197886E-02			15	
Propionitrile	3 807703E-02	7 888361	5 771111	0 1347432			15	
Styrene	1 632164	18 62952	11 52444	3 893919E-02		0 99993	0 99	
1,1,2,2-Tetrachloroethane	0 7443614	5 434138	11 87333	4 045401E-02			SPCC (0 3)	
1,1,1,2-Tetrachloroethane	0 6475189	10 14053	10 94778	4 148684E-02			15	
tert-Butyl alcohol	2 651171E-02	9 008457	4 22	0 1165554			15	
Tetrachloroethene	0 6044864	7 261824	10 25111	0 0318367			15	
Toluene	1 409399	7 980239	9 52	5 230498E-02			CCC (30)	
1,2,3-Trichlorobenzene	0 7523376	13 07447	15 75222	4 246755E-02			15	
1,2,4-Trichlorobenzene	0 8173732	13 23476	15 31444	3 697279E-02			15	
1,1,2-Trichloroethane	0 4199956	6 177849	9 674445	5 662562E-02			15	
1,1,1-Trichloroethane	0 5272058	5 17292	7 114444	7 249428E-02			15	
Tetrahydrofuran	2 559107E-02	13 61588	6 771111	5 194914E-02			15	
Trichloroethene	0 3054782	6 269524	8 251111	3 955365E-02			15	
Trichlorofluoromethane	0 5943199	4 953716	3 277778	0 2033991			15	
1,2,3-Trichloropropane	0 2301787	11 35989	11 99889	2 882502E-02			15	
1,3,5-Trimethylbenzene	2 629671	9 618818	12 53444	4 630965E-02			15	
1,2,4-Trimethylbenzene	2 603953	13 34361	12 90778	2 942101E-02			15	
1,1,2-Trichloro-1,2,2-trifluoroethane	0 2987711	4 416668	4 121111	8 230966E-02			15	
Vinyl chloride	0 3359195	6 488497	2 25	0 2221082			CCC (30)	
m,p-Xylene	2 214649	8 923809	11 16444	4 374209E-02			15	
o-Xylene	2 353435	9 92063	11 55333	4 660331E-02			15	
Vinyl acetate	0 6995535	8 801438	5 672222	7 439906E-02			15	
Xylenes (total)	2 260911	8 149375	11 55333	4 660331E-02			15	
Dibromofluoromethane	0 346217	2 658453	6 73	6 522505E-03			15	

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312151
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
1,2-Dichloroethane-d4	6 331399E-02	2 490146	7 225555	7 114916E-02			15	
Toluene-d8	2 099642	1 104215	9 441111	3 858844E-02			15	
tert-Amyl alcohol	1 524975E-02	16 26929	6 944444	7 635195E-02		0 9999426	0 99	
tert-Amyl ethyl ether	0 7811663	10 72246	8 568889	3 499845E-02			15	
1,3,5-Trichlorobenzene	0 9134864	10 18401	14 76111	1 996582E-02			15	
Diethyl ether	0 2515644	7 355314	3 695556	0 1427643			15	

INITIAL CALIBRATION CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312151
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Instrument ID:	MS-VOA6	Calibration:	3352001
Lab File ID:	1216ICV1.D	Calibration Date:	12/16/13 07:39
Sequence:	3L35205	Injection Date:	12/16/13
Lab Sample ID:	3L35205-ICV1	Injection Time:	12:15

		CONC. (ug/L)		RESPONSE FACTOR			% DIFF / DRIFT	
COMPOUND	TYPE	STD	ICV	ICAL	ICV	MIN (#)	ICV	LIMIT (#)
Benzene	A	50.00	52.33	1.009034	1.056002		4.7	20
Carbon tetrachloride	A	50.00	49.91	0.4748804	0.4740707		-0.2	20
Chloroform	A	50.00	46.69	0.6152241	0.5745107		-6.6	20
1,2-Dichloroethane	A	50.00	46.97	0.6785732	0.6374698		-6.1	20
cis-1,2-Dichloroethene	A	50.00	52.26	0.2770001	0.2894938		4.5	20
trans-1,2-Dichloroethene	A	50.00	51.74	0.2574982	0.2664364		3.5	20
Methylene chloride	A	50.00	46.79	0.3040354	0.2845066		-6.4	20
Naphthalene	Q	50.00	53.34	1.719199	2.075041		6.7	20
1,1,2,2-Tetrachloroethane	A	50.00	53.94	0.7443614	0.8030801	0.3	7.9	20
1,1,1,2-Tetrachloroethane	A	50.00	53.34	0.6475189	0.6907515		6.7	20
Tetrachloroethene	A	50.00	52.93	0.6044864	0.6398722		5.9	20
1,1,2-Trichloroethane	A	50.00	55.19	0.4199956	0.463585		10.4	20
Trichloroethene	A	50.00	51.10	0.3054782	0.3122094		2.2	20
Vinyl chloride	A	50.00	51.75	0.3359195	0.3476741		3.5	20
Bromofluorobenzene	A	30.00	29.52	0.9659739	0.9504561		-1.6	20
Dibromofluoromethane	A	30.00	28.26	0.346217	0.3261409		-5.8	20
1,2-Dichloroethane-d4	A	30.00	29.62	6.331399E-02	6.250282E-02		-1.3	20
Toluene-d8	A	30.00	30.76	2.099642	2.153026		2.5	20

CONTINUING CALIBRATION CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312151
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Instrument ID:	MS-VOA6	Calibration:	3352001
Lab File ID:	1224CCV1.D	Calibration Date:	12/16/13 07:39
Sequence:	3L36509	Injection Date:	12/24/13
Lab Sample ID:	3L36509-CCV1	Injection Time:	07:24

		CONC. (ug/L)		RESPONSE FACTOR			% DIFF / DRIFT	
COMPOUND	TYPE	STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Benzene	A	100.0	99.74	1.009034	1.006393		-0.3	20
Carbon tetrachloride	A	100.0	98.93	0.4748804	0.4698041		-1.1	20
Chloroform	A	100.0	90.30	0.6152241	0.555547		-9.7	20
1,2-Dichloroethane	A	100.0	93.61	0.6785732	0.6352067		-6.4	20
cis-1,2-Dichloroethene	A	100.0	103.4	0.2770001	0.286387		3.4	20
trans-1,2-Dichloroethene	A	100.0	98.57	0.2574982	0.2538071		-1.4	20
Methylene chloride	A	100.0	87.26	0.3040354	0.265306		-12.7	20
Naphthalene	Q	100.0	99.85	1.719199	2.050569		-0.2	20
1,1,2,2-Tetrachloroethane	A	100.0	101.0	0.7443614	0.7517106	0.3	1.0	20
1,1,1,2-Tetrachloroethane	A	100.0	101.4	0.6475189	0.6563354		1.4	20
Tetrachloroethene	A	100.0	99.02	0.6044864	0.5985381		-1.0	20
1,1,2-Trichloroethane	A	100.0	103.5	0.4199956	0.4345677		3.5	20
Trichloroethene	A	100.0	97.97	0.3054782	0.2992645		-2.0	20
Vinyl chloride	A	100.0	92.29	0.3359195	0.3100138		-7.7	20
Bromofluorobenzene	A	30.00	30.70	0.9659739	0.9886532		2.3	20
Dibromofluoromethane	A	30.00	29.12	0.346217	0.3360356		-2.9	20
1,2-Dichloroethane-d4	A	30.00	30.48	6.331399E-02	6.432718E-02		1.6	20
Toluene-d8	A	30.00	29.39	2.099642	2.056742		-2.0	20

CONTINUING CALIBRATION CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312151
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Instrument ID:	MS-VOA6	Calibration:	3352001
Lab File ID:	1227CCV1.D	Calibration Date:	12/16/13 07:39
Sequence:	3L36510	Injection Date:	12/27/13
Lab Sample ID:	3L36510-CCV1	Injection Time:	06:17

		CONC. (ug/L)		RESPONSE FACTOR			% DIFF / DRIFT	
COMPOUND	TYPE	STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Benzene	A	100.0	101.3	1.009034	1.021926		1.3	20
Carbon tetrachloride	A	100.0	100.1	0.4748804	0.475358		0.1	20
Chloroform	A	100.0	90.26	0.6152241	0.5553051		-9.7	20
1,2-Dichloroethane	A	100.0	92.78	0.6785732	0.6295673		-7.2	20
cis-1,2-Dichloroethene	A	100.0	101.9	0.2770001	0.2822906		1.9	20
trans-1,2-Dichloroethene	A	100.0	98.64	0.2574982	0.2539975		-1.4	20
Methylene chloride	A	100.0	89.23	0.3040354	0.271294		-10.8	20
Naphthalene	Q	100.0	93.79	1.719199	1.913375		-6.2	20
1,1,2,2-Tetrachloroethane	A	100.0	98.82	0.7443614	0.7355852	0.3	-1.2	20
1,1,1,2-Tetrachloroethane	A	100.0	99.71	0.6475189	0.6456499		-0.3	20
Tetrachloroethene	A	100.0	97.09	0.6044864	0.5868802		-2.9	20
1,1,2-Trichloroethane	A	100.0	100.8	0.4199956	0.4231919		0.8	20
Trichloroethene	A	100.0	98.37	0.3054782	0.3005117		-1.6	20
Vinyl chloride	A	100.0	93.42	0.3359195	0.3138079		-6.6	20
Bromofluorobenzene	A	30.00	29.53	0.9659739	0.9509616		-1.6	20
Dibromofluoromethane	A	30.00	29.47	0.346217	0.340067		-1.8	20
1,2-Dichloroethane-d4	A	30.00	30.21	6.331399E-02	0.0637497		0.7	20
Toluene-d8	A	30.00	29.68	2.099642	2.077397		-1.1	20

HOLDING TIME SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC SDG: 1312151

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-108-121813	12/18/13 09:36	12/19/13 09:25	12/24/13 13:51	N/A	14.00	12/24/13 13:51	6.18	14.00	
MW-109-121813	12/18/13 10:00	12/19/13 09:25	12/24/13 14:19	N/A	14.00	12/24/13 14:19	6.18	14.00	
MW-109S-121813	12/18/13 10:40	12/19/13 09:25	12/24/13 14:46	N/A	14.00	12/24/13 14:46	6.17	14.00	
MW-108S-121813	12/18/13 10:48	12/19/13 09:25	12/24/13 17:04	N/A	14.00	12/24/13 17:04	6.26	14.00	
MW-116-121813	12/18/13 12:52	12/19/13 09:25	12/24/13 15:14	N/A	14.00	12/24/13 15:14	6.10	14.00	
MW-110-121813	12/18/13 12:55	12/19/13 09:25	12/27/13 13:38	N/A	14.00	12/27/13 13:38	9.03	14.00	
FD-01-121813	12/18/13 13:00	12/19/13 09:25	12/27/13 14:06	N/A	14.00	12/27/13 14:06	9.05	14.00	
Trip Blank #02692	12/18/13 14:00	12/19/13 09:25	12/24/13 10:38	N/A	14.00	12/24/13 10:38	5.86	14.00	

PREPARATION BENCH SHEET

3L24002

Empirical Laboratories, LLC **Printed: 1/8/2014 12:09:00PM**

Instrument: VOA6

Matrix: Water **Prepared using: MS - 5030B** **Surrogate used: 13K0592**

Lab Number	Cont ID	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	PH	Extraction Comments
1312148-01	A	VOC_8260B_REG	12/24/2013	5	5				1	2	EB
1312148-02	B	VOC_8260B_REG	12/24/2013	5	5				1	2	
1312148-03	B	VOC_8260B_REG	12/24/2013	5	5				1	2	
1312148-04	B	VOC_8260B_REG	12/24/2013	5	5				1	2	
1312148-05	B	VOC_8260B_REG	12/24/2013	5	5				1	2	
1312148-06	B	VOC_8260B_REG	12/24/2013	5	5				1	2	
1312148-07	A	VOC_8260B_REG	12/24/2013	5	5				1	2	TB
1312151-01	B	VOC_8260B_REG	12/24/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312151-02	B	VOC_8260B_REG	12/24/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312151-03	B	VOC_8260B_REG	12/24/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312151-04	B	VOC_8260B_REG	12/24/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required-2X-T/F
1312151-05	B	VOC_8260B_REG	12/24/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312151-06	B	VOC_8260B_REG	12/24/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required-50X-T
1312151-07	B	VOC_8260B_REG	12/24/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required-50X-T
1312151-08	A	VOC_8260B_REG	12/24/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312152-01	B	VOC_8260B_REG	12/24/2013	5	5				1	2	IStoICAL-2X-F
1312152-05	B	VOC_8260B_REG	12/24/2013	5	5				1	2	IStoICAL
1312152-07	AA	VOC_8260B_REG	12/24/2013	5	5				1	2	MS/MSD; IStoICAL
3L24002-BLK1		QC	12/24/2013	5	5				1	NA	
3L24002-BS1		QC	12/24/2013	5	5	13L0538		2.5	1	NA	
3L24002-MS1		QC	12/24/2013	5	5	13L0538	1312152-07	2.5	1	NA	
3L24002-MSD1		QC	12/24/2013	5	5	13L0538	1312152-07	2.5	1	NA	

PREPARATION BENCH SHEET

3L24002

Empirical Laboratories, LLC

Printed: 1/8/2014 12:09:00PM

Instrument: VOA6

Matrix: Water **Prepared using: MS - 5030B** **Surrogate used: 13K0592**

Lab Number	Cont ID	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	PH	Extraction Comments

Reagents Used:

Standard	Description
12A0500	Anti-foam-GE_AF72

PREPARATION BENCH SHEET

3L27001

Empirical Laboratories, LLC

Printed: 1/8/2014 2:51:37PM

Instrument: VOA6

Matrix: Water **Prepared using: MS - 5030B** **Surrogate used: 13K0592**

Lab Number	Cont ID	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	PH	Extraction Comments
1312151-06RE1	B	VOC_8260B_REG	12/27/2013	5	5				1	2	Re-extract added 12/27/2013 by ADM-RR 20X lower
1312151-07RE1	B	VOC_8260B_REG	12/27/2013	5	5				1	2	Re-extract added 12/27/2013 by ADM-RR 20X lower
1312152-03	B	VOC_8260B_REG	12/27/2013	5	5				1	2	IStoICAL-2X-M/F
1312152-09	A	VOC_8260B_REG	12/27/2013	5	5				1	2	TB
1312156-01	A	VOC_8260B_REG	12/27/2013	5	5				1	2	TB
1312156-02	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions
1312156-03	B	VOC_8260B_REG	12/27/2013	5	5				1	2	MS/MSD
1312156-04	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-2X-F
1312156-05	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-10X-T
1312156-06	A	VOC_8260B_REG	12/27/2013	5	5				1	2	EB
1312156-07	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-500X-T/F
1312156-08	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-100X-T/F
1312156-09	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-10X-T
1312156-10	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-10X-T
1312156-11	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-2000X-T/F
1312159-01	B	VOC_8260B_REG	12/27/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312159-07	A	VOC_8260B_REG	12/27/2013	5	5				1	2	TB
1312160-02	B	VOC_8260B_REG	12/27/2013	5	5				1	2	TCL list-2X-heavy foam
3L27001-BLK1		QC	12/27/2013	5	5				1	NA	
3L27001-BS1		QC	12/27/2013	5	5	13L0538		2.5	1	NA	
3L27001-MS1		QC	12/27/2013	5	5	13L0538	1312156-03	2.5	1	NA	
3L27001-MSD1		QC	12/27/2013	5	5	13L0538	1312156-03	2.5	1	NA	

PREPARATION BENCH SHEET

3L27001

Empirical Laboratories, LLC

Printed: 1/8/2014 2:51:37PM

Instrument: VOA6

Matrix: Water **Prepared using: MS - 5030B** **Surrogate used: 13K0592**

Lab Number	Cont ID	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	PH	Extraction Comments

Reagents Used:

Standard	Description
12A0500	Anti-foam-GE_AF72

ANALYTICAL DATA PACKAGE
SDG # 1312159

PROJECT NAME: ST. LOUIS ORDINANCE PLANT
PROJECT LOCATION: ST. LOUIS, MO
CONTRACT #: 953646

SUBMITTAL TO:
Shane Lowe
CH2M HILL, Inc.
1034 South Brentwood Blvd., Suite 2300
Richmond Heights, MO 63117

SUBMITTAL BY:
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Original Report Date: January 8, 2014
Report Revision #: N/A
Revision Date: N/A
Total # of Pages: 91

THIS DOCUMENT MEETS DoD QSM 4.2 STANDARDS

The results relate to only the samples associated with the referenced SDG and the submitted data has been produced in accordance with laboratory procedures. The Laboratory's Technical Lab Director, Mr. Rick Davis, is responsible for the final data produced and reported. His signature is listed at the end of the Case Narrative within the Analytical Data Package. If applicable to this report package, details on report revisions and the information on subcontracted analysis are listed in the package Case Narrative. This report shall not be reproduced, except in full, without the written approval of Empirical Laboratories, LLC.

L-A-B Accredited Certificate Number L2226

Table of Contents

Sample Delivery Group Case Narrative

Receipt Information
The samples were received within the preservation guidelines for the associated methods. The information associated with sample receipt and the Sample Delivery Group (SDG) are included within section 4 of this package, which also provides information on the link between the client sample ID listed on the COC and laboratory's assigned unique sample ID or WorkOrder #. The sample is tracked through the laboratory for all analysis via the assigned WorkOrder #.

All samples that were received were analyzed and none of the samples were placed on hold without analyses. There were no subcontracted analyses for this SDG.

Changes to the Revision
This is an original submittal of the final report package.

Analytical Information
All samples were prepped (where applicable) and analyzed within the standard allowed holding times, unless noted within the exceptions listed below. The laboratory analyzed all samples within the program and method guidelines. Sample prep and dilution information is provided within the final results report and at the beginning of each form set. The following information is provided specific to individual methods:

Chromatographic Flags for Manual Integration:
The following letters are used to denote manual integrations on the laboratory's raw data in association with chromatographic integrations:

A: The peak was manually integrated as it was not integrated in the original chromatogram.
B: The peak was manually integrated due to resolution or coelution issues in the original chromatogram.
C: The peak was manually integrated to correct the baseline from the original chromatogram.
D: The peak was manually integrated to identify the correct peak as the wrong peak was identified in the original chromatogram.
E: The peak was manually integrated to include the entire peak as the original chromatogram only integrated part of the peak.

SW8260B:

Note –Sample 1312159-01 was analyzed at a 1x; however, the sample was re-analyzed at a 1x due to possible carryover from a high concentration sample analyzed previous to sample 1312159-01. The original analysis for sample 1312159-01 is not included in the report.

No additional anomalies or deviations are noted.

Data Qualifiers
As applicable and where required, the following general qualifiers are associated with the sample results. Additional qualifiers will be specified within the reporting sections of the data package or within the body of the Case Narrative.

Analytical Report Terms and Qualifiers

DL: The detection limit (DL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The DL is supported by the method detection limit (MDL) which is determined from analysis of a sample containing the analyte in a given matrix.

LOD: The Limit of Detection is an estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory-dependent. This definition is further clarified in the DoD QSM 4.2 revisions as the smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%). At the LOD, the false negative rate (Type II error) is 1%.

LOQ: The Limit of Quantitation is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. This term is further clarified within the DoD QSM 4.2 as the lowest concentration that produces a quantitative result within specified limits of precision and bias.

*****: Exceeding quality control criteria are associated with the reported result.

B: The presence of a "B" to the right of an analytical value indicates that this compound was also detected in the method blank and the data should be interpreted with caution. One should consider the possibility that the correct sample result might be less than the reported result and, perhaps, zero.

D: When a sample (or sample extract) is rerun diluted because one of the compound concentrations exceeded the highest concentration range for the standard curve, all of the values obtained in the dilution run will be flagged with a "D".

E: The concentration for any compound found which exceeds the highest concentration level on the standard curve for that compound will be flagged with an "E". Usually the sample will be rerun at a dilution to quantitate the flagged compound. For Metals, the qualifier indicates that the serial dilution was outside of the control limits and the compound should be considered estimated due to the presence of interference.

H1: The result was analyzed outside of the EPA recommended holding time.

H2: The result was extracted outside of the EPA recommended holding time.

H3: The sample for this analyte was received outside of the EPA recommended holding time.

J: The presence of a "J" to the right of an analytical result indicates that the reported result is estimated. The mass spectral data pass the identification criteria showing that the compound is present, but the calculated result is less than the LOQ. One should feel confident that the result is greater than zero and less than the LOQ.

M: Indicates that the sample matrix interfered with the quantitation of the analyte. In dual column analysis the result is reported from the column with the lower concentration. In inorganics, it indicates that the parameters DL/LOD/LOQ have been raised.

N: The MS/MSD accuracy and/or precision are outside criteria. The predigested spike recovery is not within control limits for the associated parameter.

P: The associated numerical value is an estimated quantity. There is greater than a 40% difference between the two GC columns for the detected concentrations. The higher of the two values is reported unless matrix interference is obvious or for HPLC analysis where the primary column is reported.

Q: The relative percent difference (RPD) and/or percent recovery exceeded limits in the associated Blank Spike and/or Blank Spike Duplicate.

S: The associated internal standard exceeded criteria.

U: The presence of a "U" indicates that the analyte was analyzed for but was not detected or the concentration of the analyte quantitated below the DL.

X: The parameter shows a potential positive bias on a reported concentration due to an ICV or CCV exceeding the upper control limit on the high side.

Y: The parameter shows a potential negative bias on a reported concentration due to an ICV or CCV exceeding the lower control limit on the low side.

Z: The parameter shows lack of confirmation/detection, which may be due to a negative bias in the ICV or CCV which exceeds the lower control limit.

LIMS Definitions / Naming Conventions:

The following are general naming conventions that are used throughout the laboratory; however, on a method by method basis, there are additional QAQC items that are named in a consistent format.

BLK: LIMS assigns a unique identifier to the Method Blank by naming it as the letters BLK appended to the Batch ID. A Method Blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The Method Blank is used to assess for possible contamination during preparation and/or analysis steps. Method Blanks within a Batch or Analytical sequence will be appended with a numerical value beginning with 1 that will increase incrementally.

BS: LIMS assigns a unique identifier to the Blank Spike by naming it as the letters BS appended to the Batch ID. The Blank Spike or Lab Control Sample is a controlled analyte-free matrix, which is spiked with known and verified concentrations of target analytes. Spiking concentrations can be referenced in the method SOP. The BS is used to evaluate the viability of analytes taken through the entire prep (when applicable) and analytical process. Blank Spikes within a Batch or Analytical sequence will be appended with a numerical value beginning with 1 that will increase incrementally. A duplicate Blank Spike will be designated as a BSD.

MS: The LIMS assigns each Client sample with a unique identifier. The Matrix Spike is designated with a MS at the end of the sample's unique identifier. The Matrix Spike sample is used to assess the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. A duplicate Matrix Spike will be designated as a MSD.

IDs: The LIMS assigns each Client sample with a unique identifier. The letter "RE" may potentially be appended to the end of the LIMS Sample ID. And "**RE"** implies that the sample was either re-prepped, re-analyzed straight, or re-analyzed at a dilution. Subsequent re-analysis for the sample will be appended with a numerical value beginning with 1 that will increase incrementally. Eg: RE1, RE2, RE3, etc.

Statement of Data Authenticity:
I certify that, based upon my inquiry of those individuals immediately responsible for obtaining the information and to the best of my knowledge, the data package is in compliance with the terms and conditions of the contract, both technically and for completeness, with the exception of the conditions detailed in this Case Narrative, as verified by my signature below. During absences, Ms. Marcia K. McGinnity or an approved technical designee is authorized to sign this Statement of Data Authenticity.

Mr. Rick D. Davis
Laboratory Technical Director / VP Operations

Empirical Laboratories, LLC
Certifications/Approvals
(Revised 12/16/2013)

DoD ELAP, Certificate Number L2226
- Aqueous
- Non-aqueous
- Expires: 11/30/2015

State of Florida, Department of Health – NELAP, Lab ID: E87646
- Clean Water Act
- RCRA/CERCLA
- Expires: 06/30/2014

State of Georgia, Environmental Protection Agency – NELAP
- Expires: 06/30/2014

State of Illinois, Environmental Protection Agency – NELAP, Certificate No.: 003300
- Groundwater
- Solid and Hazardous Waste
- Expires: 09/13/2014

State of Kansas Department of Health and Environment – NELAP, Certificate No.: E-10407
- Aqueous
- Non-aqueous
- Expires: 04/30/2014

State of Kentucky Department of Environmental Protection – NELAP, Certificate No.: 77
- Aqueous
- Non-aqueous
- Expires: 06/30/2014

State of Nevada, Department of Conservation and Natural Resources – NELAP, Certificate No.: TN000042013-1
- Aqueous
- Non-aqueous
- Expires: 07/31/2014

State of New Jersey Department of Environmental Protection – NELAP, Lab ID: TN473
- Water Pollution
- Solid and Hazardous Waste
- Expires: 06/30/2014

State of North Carolina, Department of Environment and Natural Resources - Certificate No.: 643
- Aqueous
- Non-aqueous
- Expires: 12/31/2014

State of North Dakota, Department of Health – NELAP, Certificate No.: R-204
- Aqueous
- Non-aqueous
- Expires: 06/30/2014

State of Texas, Commission on Environmental Quality – NELAP, Certificate No.: T104704307-13-8
- Aqueous
- Non-aqueous
- Expires: 12/31/2013

State of Utah, Department of Health – NELAP, Certificate No.: TN0042013-5
- Aqueous
- Non-aqueous
- Expires: 07/31/2014

Commonwealth of Virginia, Department of General Services – VELAP, Certificate No.: 2558 – Lab ID: 460243
- Aqueous
- Non-aqueous
- Expires: 12/14/2014

State of Washington, Department of Ecology – NELAP, Lab ID: C934-13
- Groundwater
- Solid and Hazardous Waste
- Expires: 03/18/2014

ORGANIC CALCULATIONS

GC/MS Volatiles

$$\text{Final Concentration} = \frac{\text{On-column(ug/L or ug/Kg) * Expected Vol/Weight (mL or g) * Dilution}}{\text{Initial Vol/Weight (mL or g) * (Percent Solids/100) (if applicable)}}$$

Note - Expected Vol/Weight value is found in "Final Vol" column of Preparation Batch Summary.

GC/MS Extractables

$$\text{Final Concentration} = \frac{\text{On-column(ng/uL) * Final Vol (ml) * Dilution *(1000uL/mL)}}{\text{Initial Vol/Weight (mL or g) * (Percent Solids/100) (if applicable)}}$$

= ng/mL or ng/g

= ug/L or ug/kg

GC or LC Extractables

$$\text{Final Concentration} = \frac{\text{On-column(ng/mL) * Final Vol (mL) * Dilution}}{\text{Initial Vol/Weight (mL or g) * (Percent Solids/100) (if applicable)}}$$

= ng/mL or ng/g

= ug/L or ug/kg

Sample Receipt Information

1312159

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 877-345-1113 ♦ (fax) 866-417-0548

21533

Send Results to:	Send Invoice to:
Name Shane Lowe	Name
Company CH2M Hill	Company Conteras
Address 1034 S. Brentwood	Address
City St. Louis	City
State, Zip MO, 63117	State, Zip
Phone 314-335-3000	Phone
Fax	Fax
E-mail shane.lowe@ch2m.com	E-mail
Project No./Name: 459603 / SLOP OU-2	**Sampler's (Signature):**

Analysis Requirements: Benzene, Carbon tet., Chloroform, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, Methylene chloride, 1,1,2,2-TeCA, 1,1,2-TCA, Naphthalene, 1,1,2-TCA, PCE, TCE, VC

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	Comments	No. of Bottles	*Lab Use Only* Containers/Pres.
01	12/19/13 0859	MW-124-121913	GW		3	
02	12/19/13 0910	MW-123-121913			3	
03	12/19/13 0951	MW-1245-121913			3	
04	12/19/13 0955	MW-1235-121913			3	
05	12/19/13 1058	MW-1225-121913			3	
06	12/19/13 1100	MW-122-121913			3	
07	12/19/13 1240	Trip Blank # 02691			2	

Relinquished by: (Signature)	Date/Time: 12/19/13 1400	Received By: (Signature)	REMARKS:
Relinquished by: (Signature)	Date/Time:	Received By: (Signature)	
Received for Laboratory by: (Signature)	Date/Time: 12/20/13 1220	*Temperature:* -0.1 int.	

Details:

Page 1 of 1

Cooler No. 1 of 1

Date Shipped 12/19/13

Shipped By TS

Turnaround STD

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1312159

EMPIRICAL LABORATORIES
COOLER RECEIPT FORM

Cooler Received/Opened On: 12/20/13 1220 Workorder# 1312159

1. Tracking # 9366 (last 4 digits, FedEx)

   Courier: FedEx

2. Temperature of rep. sample or temp blank when opened: -0.2 °C + correction factor (+0.1) = -0.1 °C

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES (NO) NA

4. Were custody seals on outside of cooler? (YES) NO NA

   If yes, how many and where: 1 on front

5. Were the seals intact, signed, and dated correctly? (YES) NO NA

6. Were custody papers inside cooler? (YES) NO NA

I certify that I opened the cooler and answered questions 1-6 (initial) JG

7. Were custody seals on containers: YES (NO) and Intact YES NO (NA)

   Were these signed and dated correctly? YES NO (NA)

8. Packing material used? (Bubblewrap) (Plastic bag) Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: (Ice) Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? (YES) NO NA

11. Were all container labels complete (#, date, signed, pres., etc)? (YES) NO NA

12. Did all container labels and tags agree with custody papers? (YES) NO NA

13. a. Were VOA vials received? (YES) NO NA

    b. Was there any observable headspace present in any VOA vial? YES (NO) NA

14. Was there a Trip Blank in this cooler? (YES) NO NA If multiple coolers, sequence # ____

I certify that I unloaded the cooler and answered questions 7-14 (initial) JG

15. a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES NO (NA)

    b. Did the bottle labels indicate that the correct preservatives were used YES NO (NA)

16. Was residual chlorine present? YES NO (NA)

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (initial) JG

17. Were custody papers properly filled out (ink, signed, etc)? (YES) NO NA

18. Did you sign the custody papers in the appropriate place? (YES) NO NA

19. Were correct containers used for the analysis requested? (YES) NO NA

20. Was sufficient amount of sample sent in each container? (YES) NO NA

I certify that I entered this project into LIMS and answered questions 17-20 (initial) JG

I certify that I attached a label with the unique LIMS number to each container (initial) JG

I certify that I have performed a second check of the LIMS information against the COC to confirm accuracy (initial) ____

21. Were there Non-Conformance issues at login? YES (NO) Was a NCR generated? YES (NO) # ____

Additional Details:

1312159

Empirical Laboratories, LLC

Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Project Manager: Sonya Gordon
Project Number: CH2_SLOP

Report To:
CH2M Hill, Inc.
Shane Lowe
1034 South Brentwood Blvd, Suite 2300
Richmond Heights, MO 63117
Phone: (314) 335-3024
Fax: (314) 421-3927

Invoice To:
CH2M Hill, Inc.
Accounts Payable
P.O.Box 241329
Denver, CO 80224-____
Phone :(303) 771-0952
Fax: (303) 771-0952

Due to Client: 01/16/2014 16:00 *This is the projected due date to the client, at the time of receipt, and is for report delivery via upload, and/or email, and/or shipment to meet TAT as setup by project*

Received By: Joshua T Gross
Date Received: 12/20/2013 12 20
Logged In By: Joshua T Gross
Date Logged In: 12/20/2013 15 54

Samples Received at: **-0.1 C**
Custody Seals Yes
Received On Ice Yes
Containers Intact Yes
COC/Labels Agree Yes
Preservation Confirme No

Method	Test Code	Due	TAT	Expires	Comments
1312159-01 MW-124-121913 [Water] Sampled 12/19/2013 08:59 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/10/2014 14:00	15	01/02/2014 08:59	See versions lowMDLs DIL Approval Required
1312159-02 MW-123-121913 [Water] Sampled 12/19/2013 09:10 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/10/2014 14:00	15	01/02/2014 09:10	See versions lowMDLs DIL Approval Required
1312159-03 MW-124S-121913 [Water] Sampled 12/19/2013 09:51 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/10/2014 14:00	15	01/02/2014 09:51	See versions lowMDLs DIL Approval Required
1312159-04 MW-123S-121913 [Water] Sampled 12/19/2013 09:55 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/10/2014 14:00	15	01/02/2014 09:55	See versions lowMDLs DIL Approval Required
1312159-05 MW-122S-121913 [Water] Sampled 12/19/2013 10:58 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/10/2014 14:00	15	01/02/2014 10:58	See versions lowMDLs DIL Approval Required
1312159-06 MW-122-121913 [Water] Sampled 12/19/2013 11:00 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/10/2014 14:00	15	01/02/2014 11:00	See versions lowMDLs DIL Approval Required
1312159-07 Trip Blank #02691 [Water] Sampled 12/19/2013 12:40 Central 'Client Sample'					
SW8260B	VOC_8260B_REG	01/10/2014 14:00	15	01/02/2014 12:40	See versions lowMDLs DIL Approval Required

Reviewed By

Date

1312159

Empirical Laboratories, LLC

Client:	**CH2M Hill, Inc.**	**Project Manager:**	**Sonya Gordon**
Project:	**St. Louis Ordnance Plant**	**Project Number:**	**CH2_SLOP**

Reviewed By

Date

Sample Delivery Group Assignment Form

CLIENT: CH2M Hill, Inc.
PROJECT NAME: St. Louis Ordnance Plant
SDG #: 1312159

QC LEVEL: Level III
Report Due: 1/15/2014
Client Sample Count: 7

Sample Type	Sampled	Received	Lab ID	Client ID	Report Matrix	SW8260B
Client Sample	12/19/2013	12/20/2013	1312159-01	MW-124-121913	Water	X
Client Sample	12/19/2013	12/20/2013	1312159-02	MW-123-121913	Water	X
Client Sample	12/19/2013	12/20/2013	1312159-03	MW-124S-121913	Water	X
Client Sample	12/19/2013	12/20/2013	1312159-04	MW-123S-121913	Water	X
Client Sample	12/19/2013	12/20/2013	1312159-05	MW-122S-121913	Water	X
Client Sample	12/19/2013	12/20/2013	1312159-06	MW-122-121913	Water	X
Client Sample	12/19/2013	12/20/2013	1312159-07	Trip Blank #02691	Water	X

Data for SW8260B Forms

Sample Extraction Data

Prep Method: 5030B-SW8260B

Lab Number [Field ID]	Batch	Nominal Initial/Final	Initial [mL]	Final [mL]	Dilution	% Solids	Notes	Date
1312159-07 [Trip Blank #02691]	3L27001	5 00/5 00	5 00	5 00	1 00			12/27/13

Sample Extraction Data

Prep Method: 5030B-SW8260B

Lab Number [Field ID]	Batch	Nominal Initial/Final	Initial [mL]	Final [mL]	Dilution	% Solids	Notes	Date
1312159-02 [MW-123-121913]	3L27003	5 00/5 00	5 00	5 00	1 00			12/27/13
1312159-03 [MW-124S-121913]	3L27003	5 00/5 00	5 00	5 00	1 00			12/27/13
1312159-04 [MW-123S-121913]	3L27003	5 00/5 00	5 00	5 00	1 00			12/27/13
1312159-05 [MW-122S-121913]	3L27003	5 00/5 00	5 00	5 00	1 00			12/27/13
1312159-06 [MW-122-121913]	3L27003	5 00/5 00	5 00	5 00	1 00			12/27/13

Sample Extraction Data

Prep Method: 5030B-SW8260B

Lab Number [Field ID]	Batch	Nominal Initial/Final	Initial [mL]	Final [mL]	Dilution	% Solids	Notes	Date
1312159-01RE1 [MW-124-121913]	3L31010	5 00/5 00	5 00	5 00	1 00			12/31/13

ANALYSIS DATA SHEET

MW-124-121913

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312159-01RE1 File ID: 1215901R.D

Sampled: 12/19/13 08:59 Prepared: 12/31/13 15:00 Analyzed: 12/31/13 15:00

Solids: Preparation: 5030B Dilution: 1

Batch: 3L31010 Sequence: 4A00204 Calibration: 3361001 Instrument: MS-VOA4

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform	**0.440**	0.170	0.500	1.00	J
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	29.13	97.1	75 - 120	
Dibromofluoromethane	30.00	29.69	99.0	85 - 115	
1,2-Dichloroethane-d4	30.00	28.38	94.6	70 - 120	
Toluene-d8	30.00	29.71	99.0	85 - 120	

ANALYSIS DATA SHEET

MW-123-121913

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312159-02 File ID: 1215902.D

Sampled: 12/19/13 09:10 Prepared: 12/27/13 12:12 Analyzed: 12/27/13 12:12

Solids: Preparation: 5030B Dilution: 1

Batch: 3L27003 Sequence: 3L36403 Calibration: 3361001 Instrument: MS-VOA4

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform	**0.220**	0.170	0.500	1.00	J
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.12	93.7	75 - 120	
Dibromofluoromethane	30.00	28.55	95.2	85 - 115	
1,2-Dichloroethane-d4	30.00	27.86	92.9	70 - 120	
Toluene-d8	30.00	29.20	97.3	85 - 120	

ANALYSIS DATA SHEET

MW-124S-121913

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312159-03 File ID: 1215903.D

Sampled: 12/19/13 09:51 Prepared: 12/27/13 12:40 Analyzed: 12/27/13 12:40

Solids: Preparation: 5030B Dilution: 1

Batch: 3L27003 Sequence: 3L36403 Calibration: 3361001 Instrument: MS-VOA4

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform	**0.590**	0.170	0.500	1.00	J
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	27.43	91.4	75 - 120	
Dibromofluoromethane	30.00	29.56	98.5	85 - 115	
1,2-Dichloroethane-d4	30.00	29.10	97.0	70 - 120	
Toluene-d8	30.00	28.27	94.2	85 - 120	

ANALYSIS DATA SHEET

MW-123S-121913

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312159-04 File ID: 1215904.D

Sampled: 12/19/13 09:55 Prepared: 12/27/13 13:08 Analyzed: 12/27/13 13:08

Solids: Preparation: 5030B Dilution: 1

Batch: 3L27003 Sequence: 3L36403 Calibration: 3361001 Instrument: MS-VOA4

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform	**0.230**	0.170	0.500	1.00	J
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.59	95.3	75 - 120	
Dibromofluoromethane	30.00	30.14	100	85 - 115	
1,2-Dichloroethane-d4	30.00	29.64	98.8	70 - 120	
Toluene-d8	30.00	29.87	99.6	85 - 120	

ANALYSIS DATA SHEET

MW-122S-121913

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312159-05 File ID: 1215905.D

Sampled: 12/19/13 10:58 Prepared: 12/27/13 13:35 Analyzed: 12/27/13 13:35

Solids: Preparation: 5030B Dilution: 1

Batch: 3L27003 Sequence: 3L36403 Calibration: 3361001 Instrument: MS-VOA4

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform	**0.600**	0.170	0.500	1.00	J
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.12	93.7	75 - 120	
Dibromofluoromethane	30.00	29.35	97.8	85 - 115	
1,2-Dichloroethane-d4	30.00	29.03	96.8	70 - 120	
Toluene-d8	30.00	28.49	95.0	85 - 120	

ANALYSIS DATA SHEET

MW-122-121913

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312159-06 File ID: 1215906.D

Sampled: 12/19/13 11:00 Prepared: 12/27/13 14:03 Analyzed: 12/27/13 14:03

Solids: Preparation: 5030B Dilution: 1

Batch: 3L27003 Sequence: 3L36403 Calibration: 3361001 Instrument: MS-VOA4

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform	**0.330**	0.170	0.500	1.00	J
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.68	95.6	75 - 120	
Dibromofluoromethane	30.00	29.67	98.9	85 - 115	
1,2-Dichloroethane-d4	30.00	29.21	97.4	70 - 120	
Toluene-d8	30.00	29.53	98.4	85 - 120	

ANALYSIS DATA SHEET

Trip Blank #02691

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Water Laboratory ID: 1312159-07 File ID: 1215907.D

Sampled: 12/19/13 12:40 Prepared: 12/27/13 09:58 Analyzed: 12/27/13 09:58

Solids: Preparation: 5030B Dilution: 1

Batch: 3L27001 Sequence: 3L36510 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	29.30	97.7	75 - 120	
Dibromofluoromethane	30.00	30.86	103	85 - 115	
1,2-Dichloroethane-d4	30.00	30.76	103	70 - 120	
Toluene-d8	30.00	30.23	101	85 - 120	

SURROGATE STANDARD RECOVERY AND RT SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Sequence: 3L36403
Instrument: MS-VOA4
Calibration: 3361001

Surrogate Compound	Spike Level	% Recovery	Recovery Limits	RT	CCV RT	RT Diff	RT Diff Limit	Q
Calibration Check (3L36403-CCV1) ug/L				Lab File ID: 1227CCV1.D		Analyzed: 12/27/13 07:07		
Bromofluorobenzene	30.00	93.6	80 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	95.1	80 - 120	6.68	6.68	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	99.7	80 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	98.4	80 - 120	9.41	9.41	0.0000	+/-1.000	
LCS (3L27003-BS1) ug/L				Lab File ID: 1227LCS1.D		Analyzed: 12/27/13 07:36		
Bromofluorobenzene	30.00	99.4	75 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	97.8	85 - 115	6.68	6.68	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	99.0	70 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	98.5	85 - 120	9.41	9.41	0.0000	+/-1.000	
Blank (3L27003-BLK1) ug/L				Lab File ID: 1227BLK1.D		Analyzed: 12/27/13 09:27		
Bromofluorobenzene	30.00	97.1	75 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	99.9	85 - 115	6.67	6.68	-0.0100	+/-1.000	
1,2-Dichloroethane-d4	30.00	99.7	70 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	95.7	85 - 120	9.41	9.41	0.0000	+/-1.000	
MW-123-121913 (1312159-02) ug/L				Lab File ID: 1215902.D		Analyzed: 12/27/13 12:12		
Bromofluorobenzene	30.00	93.7	75 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	95.2	85 - 115	6.68	6.68	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	92.9	70 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	97.3	85 - 120	9.41	9.41	0.0000	+/-1.000	
MW-124S-121913 (1312159-03) ug/L				Lab File ID: 1215903.D		Analyzed: 12/27/13 12:40		
Bromofluorobenzene	30.00	91.4	75 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	98.5	85 - 115	6.68	6.68	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	97.0	70 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	94.2	85 - 120	9.41	9.41	0.0000	+/-1.000	
MW-123S-121913 (1312159-04) ug/L				Lab File ID: 1215904.D		Analyzed: 12/27/13 13:08		
Bromofluorobenzene	30.00	95.3	75 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	100	85 - 115	6.68	6.68	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	98.8	70 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	99.6	85 - 120	9.41	9.41	0.0000	+/-1.000	
MW-122S-121913 (1312159-05) ug/L				Lab File ID: 1215905.D		Analyzed: 12/27/13 13:35		
Bromofluorobenzene	30.00	93.7	75 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	97.8	85 - 115	6.68	6.68	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	96.8	70 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	95.0	85 - 120	9.4	9.41	-0.0100	+/-1.000	

SURROGATE STANDARD RECOVERY AND RT SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Sequence: 3L36403
Instrument: MS-VOA4
Calibration: 3361001

Surrogate Compound	Spike Level	% Recovery	Recovery Limits	RT	CCV RT	RT Diff	RT Diff Limit	Q
MW-122-121913 (1312159-06) ug/L				Lab File ID: 1215906.D		Analyzed: 12/27/13 14:03		
Bromofluorobenzene	30.00	95.6	75 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	98.9	85 - 115	6.68	6.68	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	97.4	70 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	98.4	85 - 120	9.41	9.41	0.0000	+/-1.000	

SURROGATE STANDARD RECOVERY AND RT SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Sequence: 3L36510
Instrument: MS-VOA6
Calibration: 3352001

Surrogate Compound	Spike Level	% Recovery	Recovery Limits	RT	CCV RT	RT Diff	RT Diff Limit	Q
Calibration Check (3L36510-CCV1) ug/L				Lab File ID: 1227CCV1.D		Analyzed: 12/27/13 06:17		
Bromofluorobenzene	30.00	98.4	80 - 120	12.05	12.05	0.0000	+/-1.000	
Dibromofluoromethane	30.00	98.2	80 - 120	6.72	6.72	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	101	80 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	98.9	80 - 120	9.43	9.43	0.0000	+/-1.000	
LCS (3L27001-BS1) ug/L				Lab File ID: 1227LCS1.D		Analyzed: 12/27/13 06:45		
Bromofluorobenzene	30.00	99.9	75 - 120	12.04	12.05	-0.0100	+/-1.000	
Dibromofluoromethane	30.00	95.4	85 - 115	6.72	6.72	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	102	70 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	101	85 - 120	9.43	9.43	0.0000	+/-1.000	
Blank (3L27001-BLK1) ug/L				Lab File ID: 1227BLK1.D		Analyzed: 12/27/13 08:35		
Bromofluorobenzene	30.00	95.0	75 - 120	12.04	12.05	-0.0100	+/-1.000	
Dibromofluoromethane	30.00	99.7	85 - 115	6.71	6.72	-0.0100	+/-1.000	
1,2-Dichloroethane-d4	30.00	99.0	70 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	100	85 - 120	9.43	9.43	0.0000	+/-1.000	
Trip Blank #02691 (1312159-07) ug/L				Lab File ID: 1215907.D		Analyzed: 12/27/13 09:58		
Bromofluorobenzene	30.00	97.7	75 - 120	12.04	12.05	-0.0100	+/-1.000	
Dibromofluoromethane	30.00	103	85 - 115	6.72	6.72	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	103	70 - 120	7.21	7.21	0.0000	+/-1.000	
Toluene-d8	30.00	101	85 - 120	9.43	9.43	0.0000	+/-1.000	

SURROGATE STANDARD RECOVERY AND RT SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Sequence: 4A00204
Instrument: MS-VOA4
Calibration: 3361001

Surrogate Compound	Spike Level	% Recovery	Recovery Limits	RT	CCV RT	RT Diff	RT Diff Limit	Q
Calibration Check (4A00204-CCV1) ug/L				Lab File ID: 1231CC1.D		Analyzed: 12/31/13 10:46		
Bromofluorobenzene	30.00	97.2	80 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	95.7	80 - 120	6.69	6.69	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	96.7	80 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	97.7	80 - 120	9.41	9.41	0.0000	+/-1.000	
LCS (3L31010-BS1) ug/L				Lab File ID: 1231LCS1.D		Analyzed: 12/31/13 11:18		
Bromofluorobenzene	30.00	97.4	75 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	97.7	85 - 115	6.69	6.69	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	101	70 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	98.8	85 - 120	9.41	9.41	0.0000	+/-1.000	
Blank (3L31010-BLK1) ug/L				Lab File ID: 1231BLK1.D		Analyzed: 12/31/13 13:09		
Bromofluorobenzene	30.00	94.3	75 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	97.1	85 - 115	6.69	6.69	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	99.2	70 - 120	7.18	7.18	0.0000	+/-1.000	
Toluene-d8	30.00	95.7	85 - 120	9.41	9.41	0.0000	+/-1.000	
MW-124-121913 (1312159-01RE1) ug/L				Lab File ID: 1215901R.D		Analyzed: 12/31/13 15:00		
Bromofluorobenzene	30.00	97.1	75 - 120	12.03	12.03	0.0000	+/-1.000	
Dibromofluoromethane	30.00	99.0	85 - 115	6.69	6.69	0.0000	+/-1.000	
1,2-Dichloroethane-d4	30.00	94.6	70 - 120	7.19	7.18	0.0100	+/-1.000	
Toluene-d8	30.00	99.0	85 - 120	9.41	9.41	0.0000	+/-1.000	

LCS / LCS DUPLICATE RECOVERY

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Matrix:	Water		
Batch:	3L27001	Laboratory ID:	3L27001-BS1
Preparation:	5030B	Initial/Final:	5 mL / 5 mL

ANALYTE	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC.	QC LIMITS REC.
Benzene	50.00	51.7	103	80 - 120
Carbon tetrachloride	50.00	48.3	96.6	65 - 140
Chloroform	50.00	46.1	92.1	65 - 135
1,2-Dichloroethane	50.00	46.3	92.6	70 - 130
cis-1,2-Dichloroethene	50.00	52.1	104	70 - 125
trans-1,2-Dichloroethene	50.00	52.5	105	60 - 140
Methylene chloride	50.00	47.3	94.5	55 - 140
Naphthalene	50.00	51.0	102	55 - 140
1,1,2,2-Tetrachloroethane	50.00	50.1	100	65 - 130
1,1,1,2-Tetrachloroethane	50.00	51.8	104	80 - 130
Tetrachloroethene	50.00	50.4	101	45 - 150
1,1,2-Trichloroethane	50.00	52.1	104	75 - 125
Trichloroethene	50.00	49.3	98.7	70 - 125
Vinyl chloride	50.00	53.1	106	50 - 145

LCS / LCS DUPLICATE RECOVERY

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Matrix:	Water		
Batch:	3L27003	Laboratory ID:	3L27003-BS1
Preparation:	5030B	Initial/Final:	5 mL / 5 mL

ANALYTE	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC.	QC LIMITS REC.
Benzene	50.00	48.0	96.0	80 - 120
Carbon tetrachloride	50.00	46.8	93.6	65 - 140
Chloroform	50.00	45.3	90.7	65 - 135
1,2-Dichloroethane	50.00	46.3	92.6	70 - 130
cis-1,2-Dichloroethene	50.00	46.9	93.9	70 - 125
trans-1,2-Dichloroethene	50.00	46.3	92.6	60 - 140
Methylene chloride	50.00	47.8	95.5	55 - 140
Naphthalene	50.00	56.5	113	55 - 140
1,1,2,2-Tetrachloroethane	50.00	50.4	101	65 - 130
1,1,1,2-Tetrachloroethane	50.00	49.3	98.7	80 - 130
Tetrachloroethene	50.00	47.5	95.1	45 - 150
1,1,2-Trichloroethane	50.00	49.4	98.9	75 - 125
Trichloroethene	50.00	47.3	94.7	70 - 125
Vinyl chloride	50.00	44.2	88.4	50 - 145

LCS / LCS DUPLICATE RECOVERY

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Matrix: Water
Batch: 3L31010
Laboratory ID: 3L31010-BS1
Preparation: 5030B
Initial/Final: 5 mL / 5 mL

ANALYTE	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC.	QC LIMITS REC.
Benzene	50.00	51.0	102	80 - 120
Carbon tetrachloride	50.00	49.8	99.7	65 - 140
Chloroform	50.00	44.5	89.0	65 - 135
1,2-Dichloroethane	50.00	46.9	93.8	70 - 130
cis-1,2-Dichloroethene	50.00	51.0	102	70 - 125
trans-1,2-Dichloroethene	50.00	51.3	103	60 - 140
Methylene chloride	50.00	49.1	98.3	55 - 140
Naphthalene	50.00	54.8	110	55 - 140
1,1,2,2-Tetrachloroethane	50.00	46.3	92.6	65 - 130
1,1,1,2-Tetrachloroethane	50.00	51.3	103	80 - 130
Tetrachloroethene	50.00	50.0	99.9	45 - 150
1,1,2-Trichloroethane	50.00	48.4	96.9	75 - 125
Trichloroethene	50.00	51.5	103	70 - 125
Vinyl chloride	50.00	60.8	122	50 - 145

PREPARATION BATCH SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Batch: 3L27001 Batch Matrix: Water Preparation: 5030B

SAMPLE NAME	LAB SAMPLE ID	DATE PREPARED	INITIAL VOL /WEIGHT	FINAL VOL
Trip Blank #02691	1312159-07	12/27/13 09:58	5 00	5 00
Blank	3L27001-BLK1	12/27/13 08:35	5 00	5 00
LCS	3L27001-BS1	12/27/13 06:45	5 00	5 00

PREPARATION BATCH SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Batch: 3L27003 Batch Matrix: Water Preparation: 5030B

SAMPLE NAME	LAB SAMPLE ID	DATE PREPARED	INITIAL VOL /WEIGHT	FINAL VOL
MW-123-121913	1312159-02	12/27/13 12:12	5 00	5 00
MW-124S-121913	1312159-03	12/27/13 12:40	5 00	5 00
MW-123S-121913	1312159-04	12/27/13 13:08	5 00	5 00
MW-122S-121913	1312159-05	12/27/13 13:35	5 00	5 00
MW-122-121913	1312159-06	12/27/13 14:03	5 00	5 00
Blank	3L27003-BLK1	12/27/13 09:27	5 00	5 00
LCS	3L27003-BS1	12/27/13 07:36	5 00	5 00

PREPARATION BATCH SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Batch: 3L31010 Batch Matrix: Water Preparation: 5030B

SAMPLE NAME	LAB SAMPLE ID	DATE PREPARED	INITIAL VOL /WEIGHT	FINAL VOL
MW-124-121913	1312159-01RE1	12/31/13 15:00	5 00	5 00
Blank	3L31010-BLK1	12/31/13 13:09	5 00	5 00
LCS	3L31010-BS1	12/31/13 11:18	5 00	5 00

ANALYSIS DATA SHEET

Blank

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Laboratory ID: 3L27001-BLK1 File ID: 1227BLK1.D

Sampled: Prepared: Analyzed: 12/27/13 08:35

Solids: Preparation: 5030B Dilution:

Batch: 3L27001 Sequence: 3L36510 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.50	95.0	75 - 120	
Dibromofluoromethane	30.00	29.92	99.7	85 - 115	
1,2-Dichloroethane-d4	30.00	29.69	99.0	70 - 120	
Toluene-d8	30.00	30.05	100	85 - 120	

ANALYSIS DATA SHEET

LCS

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Laboratory ID: 3L27001-BS1 File ID: 1227LCS1.D

Sampled: Prepared: Analyzed: 12/27/13 06:45

Solids: Preparation: 5030B Dilution:

Batch: 3L27001 Sequence: 3L36510 Calibration: 3352001 Instrument: MS-VOA6

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene	**51.7**	0.150	0.500	1.00	
56-23-5	Carbon tetrachloride	**48.3**	0.170	0.500	1.00	
67-66-3	Chloroform	**46.1**	0.170	0.500	1.00	
107-06-2	1,2-Dichloroethane	**46.3**	0.160	0.500	1.00	
156-59-2	cis-1,2-Dichloroethene	**52.1**	0.140	0.500	1.00	
156-60-5	trans-1,2-Dichloroethene	**52.5**	0.220	0.500	1.00	
75-09-2	Methylene chloride	**47.3**	0.120	1.00	2.00	
91-20-3	Naphthalene	**51.0**	0.160	0.500	1.00	
79-34-5	1,1,2,2-Tetrachloroethane	**50.1**	0.140	0.500	1.00	
630-20-6	1,1,1,2-Tetrachloroethane	**51.8**	0.150	0.500	1.00	
127-18-4	Tetrachloroethene	**50.4**	0.230	0.500	1.00	
79-00-5	1,1,2-Trichloroethane	**52.1**	0.200	0.500	1.00	
79-01-6	Trichloroethene	**49.3**	0.190	0.500	1.00	
75-01-4	Vinyl chloride	**53.1**	0.140	0.500	1.00	

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	29.98	99.9	75 - 120	
Dibromofluoromethane	30.00	28.63	95.4	85 - 115	
1,2-Dichloroethane-d4	30.00	30.68	102	70 - 120	
Toluene-d8	30.00	30.32	101	85 - 120	

ANALYSIS DATA SHEET

Blank

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Laboratory ID: 3L27003-BLK1 File ID: 1227BLK1.D

Sampled: Prepared: Analyzed: 12/27/13 09:27

Solids: Preparation: 5030B Dilution:

Batch: 3L27003 Sequence: 3L36403 Calibration: 3361001 Instrument: MS-VOA4

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	29.13	97.1	75 - 120	
Dibromofluoromethane	30.00	29.96	99.9	85 - 115	
1,2-Dichloroethane-d4	30.00	29.90	99.7	70 - 120	
Toluene-d8	30.00	28.70	95.7	85 - 120	

ANALYSIS DATA SHEET

LCS

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Laboratory ID: 3L27003-BS1 File ID: 1227LCS1.D

Sampled: Prepared: Analyzed: 12/27/13 07:36

Solids: Preparation: 5030B Dilution:

Batch: 3L27003 Sequence: 3L36403 Calibration: 3361001 Instrument: MS-VOA4

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene	**48.0**	0.150	0.500	1.00	
56-23-5	Carbon tetrachloride	**46.8**	0.170	0.500	1.00	
67-66-3	Chloroform	**45.3**	0.170	0.500	1.00	
107-06-2	1,2-Dichloroethane	**46.3**	0.160	0.500	1.00	
156-59-2	cis-1,2-Dichloroethene	**46.9**	0.140	0.500	1.00	
156-60-5	trans-1,2-Dichloroethene	**46.3**	0.220	0.500	1.00	
75-09-2	Methylene chloride	**47.8**	0.120	1.00	2.00	
91-20-3	Naphthalene	**56.5**	0.160	0.500	1.00	
79-34-5	1,1,2,2-Tetrachloroethane	**50.4**	0.140	0.500	1.00	
630-20-6	1,1,1,2-Tetrachloroethane	**49.3**	0.150	0.500	1.00	
127-18-4	Tetrachloroethene	**47.5**	0.230	0.500	1.00	
79-00-5	1,1,2-Trichloroethane	**49.4**	0.200	0.500	1.00	
79-01-6	Trichloroethene	**47.3**	0.190	0.500	1.00	
75-01-4	Vinyl chloride	**44.2**	0.140	0.500	1.00	

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	29.81	99.4	75 - 120	
Dibromofluoromethane	30.00	29.35	97.8	85 - 115	
1,2-Dichloroethane-d4	30.00	29.69	99.0	70 - 120	
Toluene-d8	30.00	29.56	98.5	85 - 120	

ANALYSIS DATA SHEET

Blank

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Laboratory ID: 3L31010-BLK1 File ID: 1231BLK1.D

Sampled: Prepared: Analyzed: 12/31/13 13:09

Solids: Preparation: 5030B Dilution:

Batch: 3L31010 Sequence: 4A00204 Calibration: 3361001 Instrument: MS-VOA4

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene		0.150	0.500	1.00	U
56-23-5	Carbon tetrachloride		0.170	0.500	1.00	U
67-66-3	Chloroform		0.170	0.500	1.00	U
107-06-2	1,2-Dichloroethane		0.160	0.500	1.00	U
156-59-2	cis-1,2-Dichloroethene		0.140	0.500	1.00	U
156-60-5	trans-1,2-Dichloroethene		0.220	0.500	1.00	U
75-09-2	Methylene chloride		0.120	1.00	2.00	U
91-20-3	Naphthalene		0.160	0.500	1.00	U
79-34-5	1,1,2,2-Tetrachloroethane		0.140	0.500	1.00	U
630-20-6	1,1,1,2-Tetrachloroethane		0.150	0.500	1.00	U
127-18-4	Tetrachloroethene		0.230	0.500	1.00	U
79-00-5	1,1,2-Trichloroethane		0.200	0.500	1.00	U
79-01-6	Trichloroethene		0.190	0.500	1.00	U
75-01-4	Vinyl chloride		0.140	0.500	1.00	U

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	28.29	94.3	75 - 120	
Dibromofluoromethane	30.00	29.13	97.1	85 - 115	
1,2-Dichloroethane-d4	30.00	29.76	99.2	70 - 120	
Toluene-d8	30.00	28.71	95.7	85 - 120	

ANALYSIS DATA SHEET

LCS

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Matrix: Laboratory ID: 3L31010-BS1 File ID: 1231LCS1.D

Sampled: Prepared: Analyzed: 12/31/13 11:18

Solids: Preparation: 5030B Dilution:

Batch: 3L31010 Sequence: 4A00204 Calibration: 3361001 Instrument: MS-VOA4

CAS NO.	COMPOUND	CONC. (ug/L)	DL	LOD	LOQ	Q
71-43-2	Benzene	**51.0**	0.150	0.500	1.00	
56-23-5	Carbon tetrachloride	**49.8**	0.170	0.500	1.00	
67-66-3	Chloroform	**44.5**	0.170	0.500	1.00	
107-06-2	1,2-Dichloroethane	**46.9**	0.160	0.500	1.00	
156-59-2	cis-1,2-Dichloroethene	**51.0**	0.140	0.500	1.00	
156-60-5	trans-1,2-Dichloroethene	**51.3**	0.220	0.500	1.00	
75-09-2	Methylene chloride	**49.1**	0.120	1.00	2.00	
91-20-3	Naphthalene	**54.8**	0.160	0.500	1.00	
79-34-5	1,1,2,2-Tetrachloroethane	**46.3**	0.140	0.500	1.00	
630-20-6	1,1,1,2-Tetrachloroethane	**51.3**	0.150	0.500	1.00	
127-18-4	Tetrachloroethene	**50.0**	0.230	0.500	1.00	
79-00-5	1,1,2-Trichloroethane	**48.4**	0.200	0.500	1.00	
79-01-6	Trichloroethene	**51.5**	0.190	0.500	1.00	
75-01-4	Vinyl chloride	**60.8**	0.140	0.500	1.00	

Total Target Analytes Reported: 14

SYSTEM MONITORING COMPOUND	ADDED (ug/L)	CONC (ug/L)	% REC	QC LIMITS	Q
Bromofluorobenzene	30.00	29.21	97.4	75 - 120	
Dibromofluoromethane	30.00	29.30	97.7	85 - 115	
1,2-Dichloroethane-d4	30.00	30.30	101	70 - 120	
Toluene-d8	30.00	29.65	98.8	85 - 120	

MASS SPECTROMETER INSTRUMENT PERFORMANCE CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Lab File ID:	1216TUN1.D	Injection Date:	12/16/13
Instrument ID:	MS-VOA6	Injection Time:	06:17
Sequence:	3L35205	Lab Sample ID:	3L35205-TUN1

m/z	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
50	15 - 40% of 95	28	PASS
75	30 - 60% of 95	57.3	PASS
95	Base peak, 100% relative abundance	100	PASS
96	5 - 9% of 95	6.48	PASS
173	Less than 2% of 174	0	PASS
174	50 - 200% of 95	75.9	PASS
175	5 - 9% of 174	7.36	PASS
176	95 - 101% of 174	97.5	PASS
177	5 - 9% of 176	6.33	PASS

MASS SPECTROMETER INSTRUMENT PERFORMANCE CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Lab File ID:	1224TUN1.D	Injection Date:	12/24/13
Instrument ID:	MS-VOA4	Injection Time:	06:14
Sequence:	3L35804	Lab Sample ID:	3L35804-TUN1

m/z	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
50	15 - 40% of 95	19.5	PASS
75	30 - 60% of 95	46.9	PASS
95	Base peak, 100% relative abundance	100	PASS
96	5 - 9% of 95	6.34	PASS
173	Less than 2% of 174	0	PASS
174	50 - 200% of 95	75.7	PASS
175	5 - 9% of 174	7.13	PASS
176	95 - 101% of 174	97.6	PASS
177	5 - 9% of 176	6.5	PASS

MASS SPECTROMETER INSTRUMENT PERFORMANCE CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Lab File ID:	1227TUN1.D	Injection Date:	12/27/13
Instrument ID:	MS-VOA4	Injection Time:	06:37
Sequence:	3L36403	Lab Sample ID:	3L36403-TUN1

m/z	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
50	15 - 40% of 95	20	PASS
75	30 - 60% of 95	46.9	PASS
95	Base peak, 100% relative abundance	100	PASS
96	5 - 9% of 95	6.59	PASS
173	Less than 2% of 174	0	PASS
174	50 - 200% of 95	72.9	PASS
175	5 - 9% of 174	7.31	PASS
176	95 - 101% of 174	97.2	PASS
177	5 - 9% of 176	6.67	PASS

MASS SPECTROMETER INSTRUMENT PERFORMANCE CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Lab File ID:	1227TUN1.D	Injection Date:	12/27/13
Instrument ID:	MS-VOA6	Injection Time:	05:49
Sequence:	3L36510	Lab Sample ID:	3L36510-TUN1

m/z	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
50	15 - 40% of 95	27.3	PASS
75	30 - 60% of 95	56.1	PASS
95	Base peak, 100% relative abundance	100	PASS
96	5 - 9% of 95	6.02	PASS
173	Less than 2% of 174	0	PASS
174	50 - 200% of 95	70.3	PASS
175	5 - 9% of 174	6.63	PASS
176	95 - 101% of 174	96.8	PASS
177	5 - 9% of 176	6.25	PASS

MASS SPECTROMETER INSTRUMENT PERFORMANCE CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Lab File ID:	1231TUN1.D	Injection Date:	12/31/13
Instrument ID:	MS-VOA4	Injection Time:	09:46
Sequence:	4A00204	Lab Sample ID:	4A00204-TUN1

m/z	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
50	15 - 40% of 95	18.9	PASS
75	30 - 60% of 95	45.5	PASS
95	Base peak, 100% relative abundance	100	PASS
96	5 - 9% of 95	6.42	PASS
173	Less than 2% of 174	0	PASS
174	50 - 200% of 95	79.5	PASS
175	5 - 9% of 174	7.2	PASS
176	95 - 101% of 174	97	PASS
177	5 - 9% of 176	6.46	PASS

ANALYSIS SEQUENCE SUMMARY

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	3L35205	Instrument:	MS-VOA6
Calibration:	3352001		

Sample Name	Lab Sample ID	Lab File ID	Analysis Date/Time
MS Tune	3L35205-TUN1	1216TUN1.D	12/16/13 06:17
Cal Standard	3L35205-CAL1	1216CAL1.D	12/16/13 07:39
Cal Standard	3L35205-CAL2	1216CAL2.D	12/16/13 08:07
Cal Standard	3L35205-CAL3	1216CAL3.D	12/16/13 08:35
Cal Standard	3L35205-CAL4	1216CAL4.D	12/16/13 09:02
Cal Standard	3L35205-CAL5	1216CAL5.D	12/16/13 09:30
Cal Standard	3L35205-CAL6	1216CAL6.D	12/16/13 09:57
Cal Standard	3L35205-CAL7	1216CAL7.D	12/16/13 10:25
Cal Standard	3L35205-CAL8	1216CAL8.D	12/16/13 10:52
Cal Standard	3L35205-CAL9	1216CAL9.D	12/16/13 11:20
Initial Cal Check	3L35205-ICV1	1216ICV1.D	12/16/13 12:15

ANALYSIS SEQUENCE SUMMARY

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	3L35804	Instrument:	MS-VOA4
Calibration:	3361001		

Sample Name	Lab Sample ID	Lab File ID	Analysis Date/Time
MS Tune	3L35804-TUN1	1224TUN1.D	12/24/13 06:14
Cal Standard	3L35804-CAL1	1224CAL1.D	12/24/13 07:37
Cal Standard	3L35804-CAL2	1224CAL2.D	12/24/13 08:05
Cal Standard	3L35804-CAL3	1224CAL3.D	12/24/13 08:33
Cal Standard	3L35804-CAL4	1224CAL4.D	12/24/13 09:00
Cal Standard	3L35804-CAL5	1224CAL5.D	12/24/13 09:28
Cal Standard	3L35804-CAL6	1224CAL6.D	12/24/13 09:56
Cal Standard	3L35804-CAL7	1224CAL7.D	12/24/13 10:23
Cal Standard	3L35804-CAL8	1224CAL8.D	12/24/13 10:51
Cal Standard	3L35804-CAL9	1224CAL9.D	12/24/13 11:19
Initial Cal Check	3L35804-ICV1	1224ICV1.D	12/24/13 12:14

ANALYSIS SEQUENCE SUMMARY

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	3L36403	Instrument:	MS-VOA4
Calibration:	3361001		

Sample Name	Lab Sample ID	Lab File ID	Analysis Date/Time
MS Tune	3L36403-TUN1	1227TUN1.D	12/27/13 06:37
Calibration Check	3L36403-CCV1	1227CCV1.D	12/27/13 07:07
LCS	3L27003-BS1	1227LCS1.D	12/27/13 07:36
Blank	3L27003-BLK1	1227BLK1.D	12/27/13 09:27
MW-123-121913	1312159-02	1215902.D	12/27/13 12:12
MW-124S-121913	1312159-03	1215903.D	12/27/13 12:40
MW-123S-121913	1312159-04	1215904.D	12/27/13 13:08
MW-122S-121913	1312159-05	1215905.D	12/27/13 13:35
MW-122-121913	1312159-06	1215906.D	12/27/13 14:03

ANALYSIS SEQUENCE SUMMARY

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	3L36510	Instrument:	MS-VOA6
Calibration:	3352001		

Sample Name	Lab Sample ID	Lab File ID	Analysis Date/Time
MS Tune	3L36510-TUN1	1227TUN1.D	12/27/13 05:49
Calibration Check	3L36510-CCV1	1227CCV1.D	12/27/13 06:17
LCS	3L27001-BS1	1227LCS1.D	12/27/13 06:45
Blank	3L27001-BLK1	1227BLK1.D	12/27/13 08:35
Trip Blank #02691	1312159-07	1215907.D	12/27/13 09:58

ANALYSIS SEQUENCE SUMMARY

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	4A00204	Instrument:	MS-VOA4
Calibration:	3361001		

Sample Name	Lab Sample ID	Lab File ID	Analysis Date/Time
MS Tune	4A00204-TUN1	1231TUN1.D	12/31/13 09:46
Calibration Check	4A00204-CCV1	1231CC1.D	12/31/13 10:46
LCS	3L31010-BS1	1231LCS1.D	12/31/13 11:18
Blank	3L31010-BLK1	1231BLK1.D	12/31/13 13:09
MW-124-121913	1312159-01RE1	1215901R.D	12/31/13 15:00

INTERNAL STANDARD AREA AND RT SUMMARY
SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Sequence: 3L36403
Instrument: MS-VOA4
Calibration: 3361001

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Calibration Check (3L36403-CCV1)			Lab File ID: 1227CCV1.D			Analyzed: 12/27/13 07:07			
Fluorobenzene	1098141	7.71	1060686	7.7	104	50 - 200	0.0100	+/-0.50	
Chlorobenzene-d5	432629	10.84	404529	10.83	107	50 - 200	0.0100	+/-0.50	
1,4-Dichlorobenzene-d4	355346	13.24	343031	13.22	104	50 - 200	0.0200	+/-0.50	
LCS (3L27003-BS1)			Lab File ID: 1227LCS1.D			Analyzed: 12/27/13 07:36			
Fluorobenzene	1086321	7.71	1060686	7.71	102	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	420287	10.84	404529	10.84	104	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	351589	13.23	343031	13.24	102	50 - 200	-0.0100	+/-0.50	
Blank (3L27003-BLK1)			Lab File ID: 1227BLK1.D			Analyzed: 12/27/13 09:27			
Fluorobenzene	1084219	7.71	1060686	7.71	102	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	429659	10.84	404529	10.84	106	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	350659	13.23	343031	13.24	102	50 - 200	-0.0100	+/-0.50	
MW-123-121913 (1312159-02)			Lab File ID: 1215902.D			Analyzed: 12/27/13 12:12			
Fluorobenzene	1051760	7.71	1060686	7.71	99	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	414467	10.84	404529	10.84	102	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	319640	13.23	343031	13.24	93	50 - 200	-0.0100	+/-0.50	
MW-124S-121913 (1312159-03)			Lab File ID: 1215903.D			Analyzed: 12/27/13 12:40			
Fluorobenzene	1027533	7.71	1060686	7.71	97	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	407306	10.84	404529	10.84	101	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	322906	13.23	343031	13.24	94	50 - 200	-0.0100	+/-0.50	
MW-123S-121913 (1312159-04)			Lab File ID: 1215904.D			Analyzed: 12/27/13 13:08			
Fluorobenzene	1013920	7.71	1060686	7.71	96	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	392051	10.84	404529	10.84	97	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	307697	13.24	343031	13.24	90	50 - 200	0.0000	+/-0.50	
MW-122S-121913 (1312159-05)			Lab File ID: 1215905.D			Analyzed: 12/27/13 13:35			
Fluorobenzene	1014741	7.71	1060686	7.71	96	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	405243	10.83	404529	10.84	100	50 - 200	-0.0100	+/-0.50	
1,4-Dichlorobenzene-d4	306963	13.23	343031	13.24	89	50 - 200	-0.0100	+/-0.50	
MW-122-121913 (1312159-06)			Lab File ID: 1215906.D			Analyzed: 12/27/13 14:03			
Fluorobenzene	1010791	7.72	1060686	7.71	95	50 - 200	0.0100	+/-0.50	
Chlorobenzene-d5	396793	10.83	404529	10.84	98	50 - 200	-0.0100	+/-0.50	
1,4-Dichlorobenzene-d4	307394	13.23	343031	13.24	90	50 - 200	-0.0100	+/-0.50	

Note: As indicated by QSM 4.2 table F-4, internal standard retention times are evaluated to the continuing calibration verification rather than the midpoint of the initial calibration curve. Reference DoD QSM F-4 tables for RTW establishment: "Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used." and the following page for technical explanation on the use of daily CCV retention times in lieu of the ICAL midpoint standard: "Laboratories may update the retention times based on the CCV to account for minor performance fluctuations or after routine system maintenance (such as column clipping).

INTERNAL STANDARD AREA AND RT SUMMARY
SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	3L36510	Instrument:	MS-VOA6
		Calibration:	3352001

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Calibration Check (3L36510-CCV1)			Lab File ID: 1227CCV1.D			Analyzed: 12/27/13 06:17			
Fluorobenzene	1248304	7.74	985038	7.76	127	50 - 200	-0.0200	+/-0.50	
Chlorobenzene-d5	601060	10.85	457662	10.87	131	50 - 200	-0.0200	+/-0.50	
1,4-Dichlorobenzene-d4	538001	13.24	401927	13.25	134	50 - 200	-0.0100	+/-0.50	
LCS (3L27001-BS1)			Lab File ID: 1227LCS1.D			Analyzed: 12/27/13 06:45			
Fluorobenzene	1289812	7.74	985038	7.74	131	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	593098	10.85	457662	10.85	130	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	547198	13.24	401927	13.24	136	50 - 200	0.0000	+/-0.50	
Blank (3L27001-BLK1)			Lab File ID: 1227BLK1.D			Analyzed: 12/27/13 08:35			
Fluorobenzene	1120821	7.74	985038	7.74	114	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	516328	10.85	457662	10.85	113	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	387986	13.24	401927	13.24	97	50 - 200	0.0000	+/-0.50	
Trip Blank #02691 (1312159-07)			Lab File ID: 1215907.D			Analyzed: 12/27/13 09:58			
Fluorobenzene	1017610	7.74	985038	7.74	103	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	475968	10.85	457662	10.85	104	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	379758	13.24	401927	13.24	94	50 - 200	0.0000	+/-0.50	

Note: As indicated by QSM 4.2 table F-4, internal standard retention times are evaluated to the continuing calibration verification rather than the midpoint of the initial calibration curve. Reference DoD QSM F-4 tables for RTW establishment: "Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used." and the following page for technical explanation on the use of daily CCV retention times in lieu of the ICAL midpoint standard: "Laboratories may update the retention times based on the CCV to account for minor performance fluctuations or after routine system maintenance (such as column clipping).

INTERNAL STANDARD AREA AND RT SUMMARY
SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Sequence:	4A00204	Instrument:	MS-VOA4
		Calibration:	3361001

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Calibration Check (4A00204-CCV1)			Lab File ID: 1231CC1.D			Analyzed: 12/31/13 10:46			
Fluorobenzene	1105837	7.71	1060686	7.7	104	50 - 200	0.0100	+/-0.50	
Chlorobenzene-d5	431075	10.84	404529	10.83	107	50 - 200	0.0100	+/-0.50	
1,4-Dichlorobenzene-d4	359850	13.24	343031	13.22	105	50 - 200	0.0200	+/-0.50	
LCS (3L31010-BS1)			Lab File ID: 1231LCS1.D			Analyzed: 12/31/13 11:18			
Fluorobenzene	1107956	7.71	1060686	7.71	104	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	438620	10.84	404529	10.84	108	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	366036	13.24	343031	13.24	107	50 - 200	0.0000	+/-0.50	
Blank (3L31010-BLK1)			Lab File ID: 1231BLK1.D			Analyzed: 12/31/13 13:09			
Fluorobenzene	1094172	7.71	1060686	7.71	103	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	433708	10.84	404529	10.84	107	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	359861	13.24	343031	13.24	105	50 - 200	0.0000	+/-0.50	
MW-124-121913 (1312159-01RE1)			Lab File ID: 1215901R.D			Analyzed: 12/31/13 15:00			
Fluorobenzene	1062271	7.71	1060686	7.71	100	50 - 200	0.0000	+/-0.50	
Chlorobenzene-d5	420455	10.84	404529	10.84	104	50 - 200	0.0000	+/-0.50	
1,4-Dichlorobenzene-d4	333043	13.24	343031	13.24	97	50 - 200	0.0000	+/-0.50	

Note: As indicated by QSM 4.2 table F-4, internal standard retention times are evaluated to the continuing calibration verification rather than the midpoint of the initial calibration curve. Reference DoD QSM F-4 tables for RTW establishment: "Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used." and the following page for technical explanation on the use of daily CCV retention times in lieu of the ICAL midpoint standard: "Laboratories may update the retention times based on the CCV to account for minor performance fluctuations or after routine system maintenance (such as column clipping).

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Acetone	1	~~0.3288185~~	2	0.2220273	4	0.1623286	10	0.1481551	20	0.1274897	100	0.1233507
Acetonitrile	5	5.602495E-02	10	4.919139E-02	20	3.879023E-02	50	4.228191E-02	100	3.906914E-02	500	3.957251E-02
Acrolein	2.5	~~5.492273E-02~~	5	3.727502E-02	10	3.186782E-02	25	0.0315535	50	3.491343E-02	250	3.657385E-02
Acrylonitrile	2.5	0.1327456	5	0.1091826	10	0.10551	25	0.1111542	50	0.1039141	250	0.104849
Benzene	0.5	1.001792	1	0.8997419	2	0.9567685	5	0.9800019	10	0.9857401	50	1.041908
Allyl chloride	0.5	0.1290039	1	0.1213898	2	0.1221582	5	0.1235948	10	0.1223193	50	0.1312837
Bromobenzene	0.5	0.8259444	1	0.71856	2	0.7825523	5	0.8274245	10	0.7849139	50	0.8543822
Bromochloromethane	0.5	0.1729479	1	0.1412803	2	0.1584977	5	0.1602483	10	0.1606515	50	0.1742235
Tert-Amyl Methyl Ether	0.5	0.7530665	1	0.6342354	2	0.6689521	5	0.751513	10	0.7494703	50	0.8221681
Bromodichloromethane	0.5	0.4455311	1	0.4058173	2	0.4182092	5	0.4424072	10	0.4469204	50	0.4848844
Bromoform	0.5	0.2992146	1	0.2922096	2	0.3315837	5	0.3806187	10	0.3749049	50	0.4651812
Bromomethane	0.5	0.3337857	1	0.2620238	2	0.2305324	5	0.2638356	10	0.2480899	50	0.237613
Bromofluorobenzene	30	0.9571981	35	0.9655349	40	0.9710133	50	0.982005	60	0.9884479	70	0.9764452
n-Butylbenzene	0.5	1.63077	1	1.530071	2	1.623714	5	1.842372	10	1.927617	50	2.194212
2-Butanone	1	0.1769362	2	0.1475096	4	0.150836	10	0.1426553	20	0.1441023	100	0.148134
sec-Butylbenzene	0.5	2.636033	1	2.256345	2	2.503791	5	2.75357	10	2.930176	50	3.220494
tert-Butylbenzene	0.5	2.127834	1	1.88197	2	2.156601	5	2.359505	10	2.423421	50	2.655347
Carbon disulfide	0.5	0.8624913	1	0.6883061	2	0.764688	5	0.8074891	10	0.8392042	50	0.9107136
Carbon tetrachloride	0.5	0.4284176	1	0.4257079	2	0.4556586	5	0.4740362	10	0.4678455	50	0.5254643
Chlorobenzene	0.5	1.836998	1	1.53932	2	1.674058	5	1.728988	10	1.653791	50	1.774433
Chloroethane	0.5	0.2242158	1	0.1822821	2	0.1660879	5	0.1958606	10	0.1872501	50	0.1878772
Chloroform	0.5	0.7843929	1	0.5799134	2	0.5963625	5	0.6112162	10	0.5784279	50	0.612751
2-Chloroethyl vinyl ether	1	8.099906E-02	2	7.333291E-02	4	8.531739E-02	10	8.280067E-02	20	7.014801E-02	100	7.348515E-02
Chloromethane	0.5	0.4477065	1	0.3323947	2	0.313451	5	0.3592467	10	0.3601449	50	0.3735497
1-Chlorohexane	0.5	0.9288087	1	0.7096853	2	0.6703928	5	0.7042292	10	0.6803893	50	0.7401774
2-Chlorotoluene	0.5	2.297746	1	2.004349	2	2.363496	5	2.400817	10	2.368955	50	2.535951
Chloroprene	0.5	0.6499504	1	0.5868428	2	0.5701908	5	0.6287847	10	0.6589835	50	0.6944669
4-Chlorotoluene	0.5	2.833016	1	2.302249	2	2.627214	5	2.782515	10	2.804322	50	2.97795
Cyclohexane	0.5	0.4220363	1	0.3535059	2	0.3953851	5	0.4415826	10	0.4476266	50	0.4864473
Dibromochloromethane	0.5	0.7035714	1	0.5561912	2	0.6191473	5	0.6766387	10	0.7061886	50	0.7994532
1,2-Dibromo-3-chloropropane	0.5	~~0.1332416~~	1	7.209409E-02	2	0.1074893	5	0.126289	10	0.1173174	50	0.1521664

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
1,2-Dibromoethane (EDB)	0.5	0.6341586	1	0.5156088	2	0.5772478	5	0.6427509	10	0.6161028	50	0.6577304
Dibromomethane	0.5	0.2421995	1	0.1854057	2	0.2130608	5	0.2190477	10	0.2085717	50	0.2175011
1,2-Dichlorobenzene	0.5	1.407292	1	1.184648	2	1.351536	5	1.422387	10	1.369617	50	1.513227
1,3-Dichlorobenzene	0.5	1.428795	1	1.432168	2	1.427206	5	1.480065	10	1.499029	50	1.567131
trans-1,4-Dichloro-2-butene	0.5	~~0.2676352~~	1	0.2518055	2	0.3127859	5	0.3502759	10	0.3212036	50	0.3811003
cis-1,4-Dichloro-2-butene	0.5	0.3198566	1	0.3155188	2	0.3168749	5	0.3477989	10	0.3507495	50	0.4043255
1,4-Dichlorobenzene	0.5	1.707374	1	1.367026	2	1.454231	5	1.524296	10	1.519416	50	1.597998
Dichlorodifluoromethane	0.5	0.4704762	1	0.3875424	2	0.3951523	5	0.3825526	10	0.4779366	50	0.4882398
1,1-Dichloroethane	0.5	0.6215971	1	0.5148204	2	0.5539186	5	0.5739058	10	0.5604445	50	0.5789404
1,2-Dichloroethane	0.5	0.6977377	1	0.6492072	2	0.7149046	5	0.7101144	10	0.67133	50	0.691011
1,1-Dichloroethene	0.5	0.2675797	1	0.2221709	2	0.2395009	5	0.2447506	10	0.2557957	50	0.2570837
cis-1,2-Dichloroethene	0.5	0.2432872	1	0.2485959	2	0.2681966	5	0.2855692	10	0.2791828	50	0.2906336
trans-1,2-Dichloroethene	0.5	0.2581528	1	0.2446824	2	0.2374065	5	0.263039	10	0.2572849	50	0.2639993
1,2-Dichloroethene (total)	1	0.25072	2	0.2466391	4	0.2528015	10	0.2743041	20	0.2682338	100	0.2773164
1,2-Dichloropropane	0.5	0.266347	1	0.2328701	2	0.2608034	5	0.2741643	10	0.267286	50	0.2905274
1,3-Dichloropropane	0.5	0.8342121	1	0.8839789	2	0.9185308	5	0.9486775	10	0.9342751	50	0.9912243
2,2-Dichloropropane	0.5	0.4529276	1	0.4296573	2	0.4538864	5	0.489089	10	0.4749316	50	0.5172111
1,1-Dichloropropene	0.5	0.4012245	1	0.3583529	2	0.392503	5	0.4229588	10	0.424626	50	0.4528363
cis-1,3-Dichloropropene	0.5	0.359601	1	0.3314971	2	0.3875622	5	0.4071793	10	0.4238631	50	0.477862
trans-1,3-Dichloropropene	0.5	0.8971715	1	0.7819362	2	0.9491996	5	0.9869749	10	0.9862184	50	1.126627
Diisopropyl Ether	0.5	1.024054	1	0.9017525	2	0.9641796	5	1.040038	10	1.039067	50	1.112964
1,4-Dioxane	10	2.008661E-03	20	2.044705E-03	40	2.336114E-03	100	2.522071E-03	200	2.143985E-03	1000	2.652047E-03
Ethylbenzene	0.5	2.471944	1	2.214522	2	2.434572	5	2.684476	10	2.758637	50	2.957095
Ethyl tert-Butyl Ether	0.5	0.963577	1	0.8655258	2	0.9727006	5	1.049249	10	1.01616	50	1.116396
Ethyl Methacrylate	0.5	0.6280201	1	0.5561912	2	0.639135	5	0.7033684	10	0.696696	50	0.7859386
Hexachlorobutadiene	0.5	0.5563893	1	0.5156109	2	0.5323706	5	0.5419032	10	0.5247702	50	0.5732651
Hexane	0.5	0.2049994	1	0.196464	2	0.2098027	5	0.2321438	10	0.2439422	50	0.2540686
2-Hexanone	1	0.3953851	2	0.3723189	4	0.3950613	10	0.4464009	20	0.428934	100	0.463153
Iodomethane	0.5	0.3519145	1	0.3424476	2	0.3514375	5	0.3883598	10	0.4235499	50	0.4924456
Isobutyl alcohol	10	6.261655E-03	20	4.24918E-03	40	5.220006E-03	100	5.682173E-03	200	4.898134E-03	1000	5.645641E-03
Isopropylbenzene	0.5	~~2.013914~~	1	1.823319	2	2.181329	5	2.425183	10	2.470393	50	2.749678

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
p-Isopropyltoluene	0.5	2.414284	1	2.089967	2	2.245291	5	2.501381	10	2.570049	50	2.827357
Methacrylonitrile	5	0.22497	10	0.1930065	20	0.2089327	50	0.2237446	100	0.2139761	500	0.2226564
Methylene chloride	0.5	~~0.5828017~~	1	0.3491975	2	0.3288461	5	0.3273941	10	0.2845865	50	0.2872668
Methyl Acetate	0.5	~~0.3857064~~	1	0.3154482	2	0.2903226	5	0.3030329	10	0.2601533	50	0.2434809
Methylcyclohexane	0.5	0.3221109	1	0.2744823	2	0.2967133	5	0.3184141	10	0.3366445	50	0.3560554
Naphthalene	0.5	1.396541	1	1.309217	2	1.336731	5	1.444397	10	1.584445	50	1.887839
Methyl Methacrylate	0.5	0.3092757	1	0.2915724	2	0.3034442	5	0.324452	10	0.3110086	50	0.3413477
4-Methyl-2-pentanone	1	0.2646066	2	0.252653	4	0.2816047	10	0.3064083	20	0.2857459	100	0.309209
Methyl t-Butyl Ether	0.5	0.7599554	1	0.7730025	2	0.7712577	5	0.8224021	10	0.7764854	50	0.8366818
n-Propylbenzene	0.5	3.205478	1	2.985857	2	3.16137	5	3.395684	10	3.540615	50	3.815046
Propionitrile	5	3.860689E-02	10	3.631281E-02	20	3.519208E-02	50	3.953202E-02	100	3.526257E-02	500	3.705665E-02
Styrene	0.5	1.294131	1	1.170637	2	1.364739	5	1.573669	10	1.623073	50	1.83601
1,1,2,2-Tetrachloroethane	0.5	0.7764107	1	0.665799	2	0.7153891	5	0.7611308	10	0.7028783	50	0.7666392
1,1,1,2-Tetrachloroethane	0.5	0.6226685	1	0.562134	2	0.5591843	5	0.6168669	10	0.6211794	50	0.6923942
tert-Butyl alcohol	2.5	3.176149E-02	5	2.457954E-02	10	2.613583E-02	25	2.906846E-02	50	0.0246684	250	0.0253521
Tetrachloroethene	0.5	0.5831615	1	0.531873	2	0.5567103	5	0.5878116	10	0.6088291	50	0.6332623
Toluene	0.5	1.412809	1	1.197301	2	1.319581	5	1.380792	10	1.36182	50	1.44104
1,2,3-Trichlorobenzene	0.5	0.7666192	1	0.5883716	2	0.6407529	5	0.6965532	10	0.7155865	50	0.8062701
1,2,4-Trichlorobenzene	0.5	0.854359	1	0.6807511	2	0.676849	5	0.7072572	10	0.7758474	50	0.8834649
1,1,2-Trichloroethane	0.5	0.3890891	1	0.3958161	2	0.4014425	5	0.4122413	10	0.4019966	50	0.4322855
1,1,1-Trichloroethane	0.5	0.5217442	1	0.4704436	2	0.5074111	5	0.5415151	10	0.5462556	50	0.5666079
Tetrahydrofuran	0.5	1.841877E-02	1	2.506065E-02	2	2.459633E-02	5	2.873582E-02	10	2.212781E-02	50	2.689194E-02
Trichloroethene	0.5	0.2818651	1	0.2674811	2	0.2987899	5	0.3121037	10	0.3107088	50	0.3225856
Trichlorofluoromethane	0.5	0.6398708	1	0.5539193	2	0.5702624	5	0.5984556	10	0.6218806	50	0.6265427
1,2,3-Trichloropropane	0.5	0.1660554	1	0.2371613	2	0.2524576	5	0.2528296	10	0.2191469	50	0.2367786
1,3,5-Trimethylbenzene	0.5	2.30005	1	2.177489	2	2.526539	5	2.600353	10	2.69682	50	2.870595
1,2,4-Trimethylbenzene	0.5	2.253204	1	1.995397	2	2.275653	5	2.6207	10	2.67682	50	2.908348
1,1,2-Trichloro-1,2,2-trifluoroethan	0.5	0.3112336	1	0.2766365	2	0.2852565	5	0.3025787	10	0.3143801	50	0.3104713
Vinyl chloride	0.5	0.3408922	1	0.2999738	2	0.310551	5	0.3231103	10	0.3283657	50	0.3495405
m,p-Xylene	1	2.246943	2	1.869453	4	2.121209	10	2.292826	20	2.219465	100	2.419415
o-Xylene	0.5	2.076086	1	1.943112	2	2.221894	5	2.375454	10	2.334007	50	2.506241

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Vinyl acetate	1	0.7117693	2	0.6064282	4	0.6582203	10	0.7077768	20	0.6245841	100	0.7046624
Xylenes (total)	1.5	2.189991	3	1.894006	6	2.15477	15	2.320369	30	2.257646	150	2.448357
Dibromofluoromethane	30	0.3511555	35	0.3518626	40	0.348243	50	0.3572767	60	0.3526151	70	0.3506151
1,2-Dichloroethane-d4	30	6.416354E-02	35	6.463041E-02	40	6.380276E-02	50	6.416572E-02	60	6.290977E-02	70	6.569801E-02
Toluene-d8	30	2.080908	35	2.05466	40	2.096888	50	2.098553	60	2.104103	70	2.099524
tert-Amyl alcohol	2.5	1.535864E-02	5	1.235799E-02	10	1.185063E-02	25	1.453703E-02	50	1.333665E-02	250	1.598225E-02
tert-Amyl ethyl ether	0.5	0.7149237	1	0.6502484	2	0.6871218	5	0.7644553	10	0.7736503	50	0.8430522
1,3,5-Trichlorobenzene	0.5	0.9123402	1	0.7463691	2	0.8448275	5	0.8628449	10	0.8558897	50	0.9772468
Diethyl ether	0.5	0.264099	1	0.211723	2	0.2517096	5	0.2439819	10	0.2473803	50	0.245608

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Acetone	200	0 1223536	300	0 1242457	400	0 1203613						
Acetonitrile	1000	4 048689E-02	1500	4 303058E-02	2000	4 536802E-02						
Acrolein	500	3 837757E-02	750	3 912383E-02	1000	4 368877E-02						
Acrylonitrile	500	0 1058304	750	0 1103694	1000	0 1157639						
Benzene	100	1 045684	150	1 069117	200	1 100555						
Allyl chloride	100	0 1301861	150	0 1353574	200	0 1344522						
Bromobenzene	100	0 8347792	150	0 8609046	200	0 8587283						
Bromochloromethane	100	0 1721562	150	0 1718145	200	0 1726678						
Tert-Amyl Methyl Ether	100	0 8485488	150	0 8724162	200	0 8822091						
Bromodichloromethane	100	0 4857391	150	0 4830007	200	0 4777352						
Bromoform	100	0 4940723	150	0 5233153	200	0 5206683						
Bromomethane	100	0 2458489	150	0 2511362	200	0 2472115						
Bromofluorobenzene	30	0 954001	30	0 9524235	30	0 9466962						
n-Butylbenzene	100	2 195223	150	2 239683	200	2 210941						
2-Butanone	200	0 1517842	300	0 1519968	400	0 1574109						
sec-Butylbenzene	100	3 141262	150	3 247052	200	3 0715						
tert-Butylbenzene	100	2 599745	150	2 678873	200	2 649429						
Carbon disulfide	100	0 8828894	150	0 941503	200	0 9613434						
Carbon tetrachloride	100	0 5002427	150	0 5065613	200	0 4899897						
Chlorobenzene	100	1 78377	150	1 890187	200	1 876812						
Chloroethane	100	0 1983627	150	0 2050283	200	0 2033424						
Chloroform	100	0 5957633	150	0 5961112	200	0 5820782						
2-Chloroethyl vinyl ether	200	7 136481E-02	300	8 930096E-02	400	8 148637E-02						
Chloromethane	100	0 3895644	150	0 3950223	200	0 3922326						
1-Chlorohexane	100	0 7278216	150	0 7782844	200	0 7752522						
2-Chlorotoluene	100	2 46575	150	2 534251	200	2 433013						
Chloroprene	100	0 6591449	150	0 6663138	200	0 6694291						
4-Chlorotoluene	100	2 921919	150	2 95303	200	2 872079						
Cyclohexane	100	0 4510599	150	0 477335	200	0 495946						
Dibromochloromethane	100	0 8234533	150	0 8620765	200	0 8459628						
1,2-Dibromo-3-chloropropane	100	0 1596723	150	0 1658598	200	0 173507						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
1,2-Dibromoethane (EDB)	100	0 663114	150	0 6958268	200	0 6866003						
Dibromomethane	100	0 2167777	150	0 2146884	200	0 2170703						
1,2-Dichlorobenzene	100	1 513378	150	1 558144	200	1 528831						
1,3-Dichlorobenzene	100	1 564907	150	1 579102	200	1 598892						
trans-1,4-Dichloro-2-butene	100	0 3797488	150	0 3968828	200	0 3748107						
cis-1,4-Dichloro-2-butene	100	0 4071157	150	0 4301267	200	0 4068888						
1,4-Dichlorobenzene	100	1 591644	150	1 624969	200	1 62976						
Dichlorodifluoromethane	100	0 4434886	150	0 4398639	200	0 4336788						
1,1-Dichloroethane	100	0 5680167	150	0 576059	200	0 5821218						
1,2-Dichloroethane	100	0 6743237	150	0 6614162	200	0 6371142						
1,1-Dichloroethene	100	0 2497366	150	0 2631636	200	0 2638804						
cis-1,2-Dichloroethene	100	0 2899578	150	0 2937441	200	0 2938337						
trans-1,2-Dichloroethene	100	0 2577781	150	0 2655436	200	0 2695976						
1,2-Dichloroethene (total)	200	0 273868	300	0 2796439	400	0 2817156						
1,2-Dichloropropane	100	0 2951371	150	0 3028902	200	0 303376						
1,3-Dichloropropane	100	0 9828179	150	1 01845	200	1 021113						
2,2-Dichloropropane	100	0 4978559	150	0 5065538	200	0 4904188						
1,1-Dichloropropene	100	0 4292606	150	0 4402576	200	0 4435662						
cis-1,3-Dichloropropene	100	0 4898485	150	0 4880797	200	0 4936149						
trans-1,3-Dichloropropene	100	1 157612	150	1 20862	200	1 188933						
Diisopropyl Ether	100	1 111236	150	1 135147	200	1 153771						
1,4-Dioxane	2000	2 79041E-03	3000	2 808772E-03	4000	2 95784E-03						
Ethylbenzene	100	2 972394	150	3 127638	200	2 970953						
Ethyl tert-Butyl Ether	100	1 11604	150	1 124914	200	1 132971						
Ethyl Methacrylate	100	0 8139891	150	0 8582517	200	~~0 889472~~						
Hexachlorobutadiene	100	0 5576849	150	0 5798926	200	0 5687879						
Hexane	100	0 2336751	150	0 2502461	200	0 2584357						
2-Hexanone	200	0 4644608	300	0 5025928	400	0 5090106						
Iodomethane	100	0 4981459	150	0 5237961	200	0 5335033						
Isobutyl alcohol	2000	5 873728E-03	3000	6 344857E-03	4000	6 877599E-03						
Isopropylbenzene	100	2 688822	150	2 860662	200	2 784206						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
p-Isopropyltoluene	100	2 802304	150	2 871013	200	2 800058						
Methacrylonitrile	1000	0 223612	1500	0 2295319	2000	0 2297651						
Methylene chloride	100	0 2815487	150	0 2842341	200	0 289209						
Methyl Acetate	100	0 2417526	150	0 2459678	200	0 2563304						
Methylcyclohexane	100	0 329101	150	0 3514488	200	0 3631279						
Naphthalene	100	2 104761	150	2 135807	200	2 27305						
Methyl Methacrylate	100	0 3472788	150	0 3568722	200	0 3612607						
4-Methyl-2-pentanone	200	0 31566	300	0 3235698	400	0 3336355						
Methyl t-Butyl Ether	100	0 8371678	150	0 8593533	200	0 8713245						
n-Propylbenzene	100	3 747354	150	3 8915	200	3 449316						
Propionitrile	1000	3 713059E-02	1500	3 857757E-02	2000	4 502207E-02						
Styrene	100	1 875727	150	1 962025	200	1 989463						
1,1,2,2-Tetrachloroethane	100	0 7527225	150	0 7735203	200	0 7847629						
1,1,1,2-Tetrachloroethane	100	0 7042877	150	0 7302072	200	0 7187477						
tert-Butyl alcohol	500	2 495374E-02	750	2 620211E-02	1000	2 588372E-02						
Tetrachloroethene	100	0 6199359	150	0 661779	200	0 6570152						
Toluene	100	1 470023	150	1 534846	200	1 566377						
1,2,3-Trichlorobenzene	100	0 8351867	150	0 854558	200	0 8671405						
1,2,4-Trichlorobenzene	100	0 9129762	150	0 9340574	200	0 9307971						
1,1,2-Trichloroethane	100	0 4319802	150	0 4566432	200	0 458466						
1,1,1-Trichloroethane	100	0 5293447	150	0 5396075	200	0 5219224						
Tetrahydrofuran	100	2 769061E-02	150	2 782133E-02	200	2 897638E-02						
Trichloroethene	100	0 3174289	150	0 3209899	200	0 3173508						
Trichlorofluoromethane	100	0 5773918	150	0 5890049	200	0 5715509						
1,2,3-Trichloropropane	100	0 2312847	150	0 2404587	200	0 2354357						
1,3,5-Trimethylbenzene	100	2 832287	150	2 864537	200	2 798373						
1,2,4-Trimethylbenzene	100	2 889999	150	2 913238	200	2 90222						
1,1,2-Trichloro-1,2,2-trifluoroethan	100	0 2862736	150	0 2997365	200	0 3023734						
Vinyl chloride	100	0 3502053	150	0 3647242	200	0 3559123						
m,p-Xylene	200	2 452378	300	2 344619	400	1 965535						
o-Xylene	100	2 535753	150	2 586349	200	2 602022						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Vinyl acetate	200	0 7176122	300	0 7803305	400	0 784598						
Xylenes (total)	300	2 480169	450	2 425196	600	2 177697						
Dibromofluoromethane	30	0 3394245	30	0 3340694	30	0 3306909						
1,2-Dichloroethane-d4	30	6 086263E-02	30	6 184593E-02	30	6 174716E-02						
Toluene-d8	30	2 101308	30	2 130443	30	2 130386						
tert-Amyl alcohol	500	0 0167918	750	1 784867E-02	1000	1 918408E-02						
tert-Amyl ethyl ether	100	0 855408	150	0 8698864	200	0 8717509						
1,3,5-Trichlorobenzene	100	0 9946224	150	1 015757	200	1 01148						
Diethyl ether	100	0 2546247	150	0 2726478	200	0 2723049						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
Acetone	0 143789	24 31662	3 59125	0 1787929	0 999671		0 995	
Acetonitrile	4 375729E-02	13 03298	3 666667	0 5783599			15	
Acrolein	3 667172E-02	10 85392	3 475	0 1539715			15	
Acrylonitrile	0 1110355	8 081635	4 42	0 1595104			15	
Benzene	1 009034	6 121714	7 485555	7 189717E-02			15	
Allyl chloride	0 1277495	4 298736	4 487778	9 646297E-02			15	
Bromobenzene	0 8164655	5 724375	12 21778	3 150273E-02			15	
Bromochloromethane	0 1649431	6 610323	6 578889	4 857425E-02			15	
Tert-Amyl Methyl Ether	0 7758422	11 2879	7 685556	0 0694881			15	
Bromodichloromethane	0 4544716	6 611337	8 474444	6 333754E-02			15	
Bromoform	0 4090854	22 79818	11 62444	4 373709E-02		0 9995946	SPCC (0 1)	
Bromomethane	0 2577863	11 77635	2 671111	0 1253754			15	
Bromofluorobenzene	0 9659739	1 497042	12 05778	2 916133E-02			15	
n-Butylbenzene	1 932734	14 92743	13 64556	3 968718E-02			15	
2-Butanone	0 1523739	6 709003	6 051111	5 124335E-02			15	
sec-Butylbenzene	2 862247	12 11066	13 10556	3 988223E-02			15	
tert-Butylbenzene	2 392525	11 89966	12 87667	4 356942E-02			15	
Carbon disulfide	0 8509587	10 26425	4 571111	7 083462E-02			15	
Carbon tetrachloride	0 4748804	7 229955	7 452222	6 084384E-02			15	
Chlorobenzene	1 750929	6 53941	10 90222	3 945996E-02			SPCC (0 3)	
Chloroethane	0 1944786	8 41338	2 8	9 061371E-03			15	
Chloroform	0 6152241	10 50876	6 554445	8 215545E-02			CCC (30)	
2-Chloroethyl vinyl ether	7 869282E-02	8 630171	8 84	5 305915E-02			15	
Chloromethane	0 3737014	10 47359	2 102222	0 2083576			SPCC (0 1)	
1-Chlorohexane	0 7461157	10 46423	10 87667	4 793572E-02			15	
2-Chlorotoluene	2 378259	6 762953	12 43556	4 278261E-02			15	
Chloroprene	0 6426785	6 29916	5 85	8 738947E-02			15	
4-Chlorotoluene	2 786033	7 533473	12 50222	3 551636E-02			15	
Cyclohexane	0 4412139	10 33837	7 381111	4 442025E-02			15	
Dibromochloromethane	0 7325203	14 56001	10 14	5 259225E-02			15	
1,2-Dibromo-3-chloropropane	0 1342994	25 85084	14 24125	1 845794E-02		0 9999589	0 99	
1,2-Dibromoethane (EDB)	0 6321267	8 949404	10 34889	2 811125E-02			15	

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
Dibromomethane	0 2149248	6 764273	8 405555	5 955256E-02			15	
1,2-Dichlorobenzene	1 427673	8 235468	13 60111	1 929657E-02			15	
1,3-Dichlorobenzene	1 508588	4 655512	13 19333	3 685081E-02			15	
trans-1,4-Dichloro-2-butene	0 3460767	13 9858	12 02125	2 376142E-02			15	
cis-1,4-Dichloro-2-butene	0 3665839	12 42429	11 70889	2 758372E-02			15	
1,4-Dichlorobenzene	1 557413	6 600556	13 28222	3 724333E-02			15	
Dichlorodifluoromethane	0 4354368	9 122488	1 902222	0 2317774			15	
1,1-Dichloroethane	0 5699805	4 9389	5 59	1 317553E-02			SPCC (0 1)	
1,2-Dichloroethane	0 6785732	3 962158	7 318889	4 316269E-02			15	
1,1-Dichloroethene	0 251518	5 710461	4 04	0 0136054			CCC (30)	
cis-1,2-Dichloroethene	0 2770001	7 01021	6 301111	0 1244704			15	
trans-1,2-Dichloroethene	0 2574982	4 009072	5 204444	0 1000304			15	
1,2-Dichloroethene (total)	0 2672492	5 064489	6 301111	0 1244704			15	
1,2-Dichloropropane	0 2770446	8 371838	8 297778	4 797973E-02			CCC (30)	
1,3-Dichloropropane	0 9481422	6 617396	9 883334	4 963371E-02			15	
2,2-Dichloropropane	0 4791702	5 979964	6 406667	7 735277E-02			15	
1,1-Dichloropropene	0 4183984	7 092991	7 333333	6 658381E-02			15	
cis-1,3-Dichloropropene	0 4287898	14 35212	9 045556	5 672472E-02			15	
trans-1,3-Dichloropropene	1 031477	14 22543	9 521111	3 532554E-02			15	
Diisopropyl Ether	1 053579	7 930613	5 972222	7 036451E-02			15	
1,4-Dioxane	2 473845E-03	14 35623	8 46	6 046944E-02			15	
Ethylbenzene	2 73247	11 19746	11 05	4 248291E-02			CCC (30)	
Ethyl tert-Butyl Ether	1 039726	8 928137	6 436667	7 972155E-02			15	
Ethyl Methacrylate	0 7101988	14 49481	9 71375	5 660601E-02			15	
Hexachlorobutadiene	0 550075	4 107061	15 60111	2 482048E-02			15	
Hexane	0 2315308	9 833396	5 795556	9 331608E-02			15	
2-Hexanone	0 4419242	10 89205	9 825555	0 0546362			15	
Iodomethane	0 4339556	18 14902	4 233333	0 1187631		0 9999163	0 99	
Isobutyl alcohol	5 672553E-03	14 10708	6 668889	0 1166975			15	
Isopropylbenzene	2 497949	14 15158	11 94875	2 108918E-02			15	
p-Isopropyltoluene	2 569078	10 91057	13 24333	3 673612E-02			15	
Methacrylonitrile	0 2189106	5 409314	6 221111	0 2473932			15	

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
Methylene chloride	0 3040354	8 770955	4 5325	0 103154			15	
Methyl Acetate	0 2695611	10 7981	4 40625	0 1179939			15	
Methylcyclohexane	0 3275665	8 778339	8 62	0 0571821			15	
Naphthalene	1 719199	22 24028	15 46556	3 240156E-02		0 9997636	0 99	
Methyl Methacrylate	0 3273903	7 688068	8 436666	0 0549356			15	
4-Methyl-2-pentanone	0 2970103	9 231002	8 977777	4 607543E-02			15	
Methyl t-Butyl Ether	0 8119589	5 200309	5 214444	0 1008507			15	
n-Propylbenzene	3 465802	9 032782	12 35556	4 197886E-02			15	
Propionitrile	3 807703E-02	7 888361	5 771111	0 1347432			15	
Styrene	1 632164	18 62952	11 52444	3 893919E-02		0 99993	0 99	
1,1,2,2-Tetrachloroethane	0 7443614	5 434138	11 87333	4 045401E-02			SPCC (0 3)	
1,1,1,2-Tetrachloroethane	0 6475189	10 14053	10 94778	4 148684E-02			15	
tert-Butyl alcohol	2 651171E-02	9 008457	4 22	0 1165554			15	
Tetrachloroethene	0 6044864	7 261824	10 25111	0 0318367			15	
Toluene	1 409399	7 980239	9 52	5 230498E-02			CCC (30)	
1,2,3-Trichlorobenzene	0 7523376	13 07447	15 75222	4 246755E-02			15	
1,2,4-Trichlorobenzene	0 8173732	13 23476	15 31444	3 697279E-02			15	
1,1,2-Trichloroethane	0 4199956	6 177849	9 674445	5 662562E-02			15	
1,1,1-Trichloroethane	0 5272058	5 17292	7 114444	7 249428E-02			15	
Tetrahydrofuran	2 559107E-02	13 61588	6 771111	5 194914E-02			15	
Trichloroethene	0 3054782	6 269524	8 251111	3 955365E-02			15	
Trichlorofluoromethane	0 5943199	4 953716	3 277778	0 2033991			15	
1,2,3-Trichloropropane	0 2301787	11 35989	11 99889	2 882502E-02			15	
1,3,5-Trimethylbenzene	2 629671	9 618818	12 53444	4 630965E-02			15	
1,2,4-Trimethylbenzene	2 603953	13 34361	12 90778	2 942101E-02			15	
1,1,2-Trichloro-1,2,2-trifluoroethane	0 2987711	4 416668	4 121111	8 230966E-02			15	
Vinyl chloride	0 3359195	6 488497	2 25	0 2221082			CCC (30)	
m,p-Xylene	2 214649	8 923809	11 16444	4 374209E-02			15	
o-Xylene	2 353435	9 92063	11 55333	4 660331E-02			15	
Vinyl acetate	0 6995535	8 801438	5 672222	7 439906E-02			15	
Xylenes (total)	2 260911	8 149375	11 55333	4 660331E-02			15	
Dibromofluoromethane	0 346217	2 658453	6 73	6 522505E-03			15	

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3352001
Instrument: MS-VOA6
Matrix: Water
Calibration Dates: 12/16/13 7:39 12/16/13 11:20

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
1,2-Dichloroethane-d4	6 331399E-02	2 490146	7 225555	7 114916E-02			15	
Toluene-d8	2 099642	1 104215	9 441111	3 858844E-02			15	
tert-Amyl alcohol	1 524975E-02	16 26929	6 944444	7 635195E-02		0 9999426	0 99	
tert-Amyl ethyl ether	0 7811663	10 72246	8 568889	3 499845E-02			15	
1,3,5-Trichlorobenzene	0 9134864	10 18401	14 76111	1 996582E-02			15	
Diethyl ether	0 2515644	7 355314	3 695556	0 1427643			15	

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Acetone	1	~~0.1732755~~	2	0.1388817	4	0.1139154	10	9.574427E-02	20	0.0853691	100	0.0953608
Acetonitrile	5	~~7.303428E-02~~	10	6.198338E-02	20	6.171756E-02	50	5.163431E-02	100	4.799542E-02	500	0.0514066
Acrolein	2.5	4.019259E-02	5	4.291532E-02	10	0.0453084	25	0.0455676	50	0.0420417	250	4.836368E-02
Acrylonitrile	2.5	0.1103265	5	0.1120589	10	0.1273977	25	0.1204438	50	0.1100176	250	0.123351
Benzene	0.5	1.122944	1	1.148305	2	1.15008	5	1.182724	10	1.13848	50	1.158709
Allyl chloride	0.5	0.1439291	1	0.1472252	2	0.1518023	5	0.1478066	10	0.1439929	50	0.1489121
Bromobenzene	0.5	0.8549696	1	0.8850499	2	0.858044	5	0.8857425	10	0.9186858	50	0.9067632
Bromochloromethane	0.5	0.1404967	1	0.153946	2	0.1607495	5	0.1599861	10	0.1523861	50	0.1592937
Tert-Amyl Methyl Ether	0.5	0.6858369	1	0.7254132	2	0.749405	5	0.7545717	10	0.7353204	50	0.8015984
Bromodichloromethane	0.5	0.3668589	1	0.3749849	2	0.3932863	5	0.4094968	10	0.4019931	50	0.4150377
Bromoform	0.5	0.3912797	1	0.4034662	2	0.413333	5	0.4312917	10	0.4116039	50	0.4784286
Bromomethane	0.5	0.2479287	1	0.2293681	2	0.2639193	5	0.2365224	10	0.2160424	50	0.2160381
Bromofluorobenzene	30	0.8893484	35	0.8604892	40	0.905492	50	0.8975295	60	0.8777863	70	0.9423916
n-Butylbenzene	0.5	2.300672	1	2.243486	2	2.397065	5	2.554768	10	2.557712	50	2.600514
2-Butanone	1	0.1642084	2	0.1708485	4	0.1549795	10	0.1582149	20	0.1351486	100	0.1542968
sec-Butylbenzene	0.5	2.87269	1	3.02669	2	3.010284	5	3.347681	10	3.357902	50	3.287903
tert-Butylbenzene	0.5	2.208764	1	2.233059	2	2.320714	5	2.434859	10	2.457874	50	2.525685
Carbon disulfide	0.5	1.043085	1	1.030749	2	1.028986	5	1.053025	10	1.036927	50	1.092923
Carbon tetrachloride	0.5	0.297297	1	0.2921528	2	0.3084154	5	0.3171619	10	0.3072225	50	0.3382931
Chlorobenzene	0.5	1.715852	1	1.782349	2	1.814457	5	1.831718	10	1.715462	50	1.842051
Chloroethane	0.5	0.2176098	1	0.2048401	2	0.2189287	5	0.2234102	10	0.2080024	50	0.2277859
Chloroform	0.5	0.5928779	1	0.5463073	2	0.5511583	5	0.5411802	10	0.515808	50	0.5275748
2-Chloroethyl vinyl ether	1	0.1630357	2	0.1904938	4	0.1894644	10	0.2035617	20	0.1954226	100	0.2179672
Chloromethane	0.5	0.4018115	1	0.3608253	2	0.3565234	5	0.3433451	10	0.3562695	50	0.3647644
1-Chlorohexane	0.5	0.9760396	1	0.8858475	2	0.8521149	5	0.864622	10	0.8292904	50	0.8616226
2-Chlorotoluene	0.5	2.462624	1	2.545019	2	2.520681	5	2.484427	10	2.61745	50	2.62101
Chloroprene	0.5	0.454555	1	0.4375399	2	0.4904763	5	0.4916831	10	0.4800547	50	0.4924895
4-Chlorotoluene	0.5	2.893814	1	2.951377	2	2.958628	5	2.996501	10	3.001132	50	3.027457
Cyclohexane	0.5	0.5313248	1	0.4749924	2	0.4899668	5	0.5097781	10	0.4846362	50	0.4999926
Dibromochloromethane	0.5	0.6380824	1	0.6788607	2	0.6986476	5	0.7373682	10	0.7087127	50	0.7846518
1,2-Dibromo-3-chloropropane	0.5	0.1311917	1	0.1349871	2	0.1395762	5	0.1476051	10	0.1395207	50	0.1640103

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
1,2-Dibromoethane (EDB)	0.5	0.6071017	1	0.6556417	2	0.6889786	5	0.6713328	10	0.6443351	50	0.7005153
Dibromomethane	0.5	0.1815131	1	0.206707	2	0.2097417	5	0.2045595	10	0.190785	50	0.2093491
1,2-Dichlorobenzene	0.5	1.447741	1	1.367	2	1.460592	5	1.514702	10	1.474448	50	1.519683
1,3-Dichlorobenzene	0.5	1.55262	1	1.483555	2	1.545348	5	1.595027	10	1.579736	50	1.592759
trans-1,4-Dichloro-2-butene	0.5	0.273316	1	0.2885	2	0.267584	5	0.2862146	10	0.2860784	50	0.3056016
cis-1,4-Dichloro-2-butene	0.5	0.2514507	1	0.3098187	2	0.3103634	5	0.2968525	10	0.3174781	50	0.3299471
1,4-Dichlorobenzene	0.5	1.646567	1	1.528799	2	1.648142	5	1.632763	10	1.604213	50	1.613754
Dichlorodifluoromethane	0.5	0.2946656	1	0.2517132	2	0.2613116	5	0.2811195	10	0.3364927	50	0.347667
1,1-Dichloroethane	0.5	0.566449	1	0.5507017	2	0.5915929	5	0.6122438	10	0.5672938	50	0.5978174
1,2-Dichloroethane	0.5	0.408905	1	0.4377409	2	0.4261376	5	0.4578132	10	0.4192249	50	0.4473402
1,1-Dichloroethene	0.5	0.2458693	1	0.2468019	2	0.2465495	5	0.2607161	10	0.2496127	50	0.2681912
cis-1,2-Dichloroethene	0.5	0.2894027	1	0.3030669	2	0.3063922	5	0.3082236	10	0.2967036	50	0.3071145
trans-1,2-Dichloroethene	0.5	0.2874577	1	0.2785102	2	0.2823532	5	0.2894674	10	0.2853603	50	0.29369
1,2-Dichloroethene (total)	1	0.2884302	2	0.2907885	4	0.2943727	10	0.2988455	20	0.2910319	100	0.3004023
1,2-Dichloropropane	0.5	0.3197216	1	0.3335976	2	0.3446837	5	0.3345721	10	0.3350392	50	0.3573391
1,3-Dichloropropane	0.5	1.095941	1	1.118919	2	1.1307	5	1.172299	10	1.091811	50	1.164143
2,2-Dichloropropane	0.5	0.3503838	1	0.3767082	2	0.3871416	5	0.3829181	10	0.3789216	50	0.3864502
1,1-Dichloropropene	0.5	0.4045002	1	0.3896615	2	0.4098018	5	0.4204601	10	0.4037625	50	0.4298088
cis-1,3-Dichloropropene	0.5	0.4087334	1	0.4319679	2	0.4584044	5	0.4631266	10	0.4495005	50	0.4777682
trans-1,3-Dichloropropene	0.5	0.9866148	1	1.048086	2	1.073304	5	1.112198	10	1.081922	50	1.169519
Diisopropyl Ether	0.5	1.138275	1	1.232229	2	1.250972	5	1.292688	10	1.223093	50	1.283535
1,4-Dioxane	10	1.684702E-03	20	2.009053E-03	40	2.064446E-03	100	2.146018E-03	200	2.025936E-03	1000	2.174904E-03
Ethylbenzene	0.5	2.851859	1	2.825145	2	3.153042	5	3.152457	10	3.023917	50	3.237253
Ethyl tert-Butyl Ether	0.5	0.8398341	1	0.9225272	2	0.934823	5	0.9429785	10	0.932666	50	0.982088
Ethyl Methacrylate	0.5	0.7189598	1	0.8052424	2	0.8582645	5	0.8864879	10	0.8272677	50	0.9556636
Hexachlorobutadiene	0.5	0.3572565	1	0.3222003	2	0.3237733	5	0.3215809	10	0.3282046	50	0.3403692
Hexane	0.5	0.271955	1	0.2519717	2	0.242563	5	0.2596298	10	0.2565755	50	0.2631699
2-Hexanone	1	0.4213667	2	0.4896923	4	0.5065621	10	0.5025671	20	0.4532319	100	0.5462817
Iodomethane	0.5	0.2988416	1	0.3004532	2	0.3374451	5	0.3754557	10	0.386051	50	0.4497811
Isobutyl alcohol	10	4.953997E-03	20	6.021415E-03	40	6.318478E-03	100	5.531235E-03	200	5.292195E-03	1000	6.416415E-03
Isopropylbenzene	0.5	2.283334	1	2.240189	2	2.492606	5	2.524327	10	2.409733	50	2.630619

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
p-Isopropyltoluene	0.5	2.447059	1	2.508805	2	2.53598	5	2.606278	10	2.612685	50	2.721553
Methacrylonitrile	5	0.1976679	10	0.2184741	20	0.2192704	50	0.217778	100	0.200296	500	0.2164319
Methylene chloride	0.5	~~0.6528293~~	1	0.4639347	2	0.4076287	5	0.3479914	10	0.3254683	50	0.3199298
Methyl Acetate	0.5	0.2575964	1	0.2671653	2	0.2821134	5	0.2539917	10	0.2311917	50	0.2556098
Methylcyclohexane	0.5	0.3722935	1	0.3281405	2	0.348955	5	0.3715474	10	0.3607764	50	0.3764249
Naphthalene	0.5	1.597463	1	1.776058	2	1.915773	5	1.982413	10	2.005487	50	2.284258
Methyl Methacrylate	0.5	0.267493	1	0.2754657	2	0.2808995	5	0.2786694	10	0.2654801	50	0.2981419
4-Methyl-2-pentanone	1	0.2712399	2	0.3070735	4	0.3159464	10	0.293048	20	0.2826616	100	0.3170965
Methyl t-Butyl Ether	0.5	0.6723936	1	0.7124024	2	0.7380449	5	0.7386257	10	0.7079632	50	0.7706852
n-Propylbenzene	0.5	3.906844	1	3.855418	2	3.923668	5	4.09263	10	4.100761	50	4.276308
Propionitrile	5	3.290461E-02	10	3.883403E-02	20	3.854931E-02	50	4.017688E-02	100	3.644445E-02	500	4.166734E-02
Styrene	0.5	1.565268	1	1.636349	2	1.727204	5	1.771194	10	1.71518	50	1.871788
1,1,2,2-Tetrachloroethane	0.5	0.8673846	1	1.018454	2	1.031853	5	1.032601	10	0.9962248	50	1.02894
1,1,1,2-Tetrachloroethane	0.5	0.5481193	1	0.562472	2	0.6053219	5	0.6219534	10	0.5918904	50	0.6485627
tert-Butyl alcohol	2.5	1.654383E-02	5	2.061613E-02	10	1.909032E-02	25	1.814226E-02	50	1.573583E-02	250	1.822074E-02
Tetrachloroethene	0.5	0.6656373	1	0.5784901	2	0.6206376	5	0.6432756	10	0.5888021	50	0.6497712
Toluene	0.5	1.680701	1	1.543914	2	1.594467	5	1.64619	10	1.582567	50	1.662369
1,2,3-Trichlorobenzene	0.5	0.6103749	1	0.6837795	2	0.7078438	5	0.7349274	10	0.7487733	50	0.8066358
1,2,4-Trichlorobenzene	0.5	0.7497197	1	0.790559	2	0.8142258	5	0.841642	10	0.8822081	50	0.9150034
1,1,2-Trichloroethane	0.5	0.5341184	1	0.5344035	2	0.5657561	5	0.5864516	10	0.5448034	50	0.5747196
1,1,1-Trichloroethane	0.5	0.3528436	1	0.3664547	2	0.376411	5	0.4015917	10	0.3782839	50	0.3995042
Tetrahydrofuran	0.5	~~1.779091E-02~~	1	2.533216E-02	2	2.441366E-02	5	2.983171E-02	10	2.763293E-02	50	3.036334E-02
Trichloroethene	0.5	0.2808791	1	0.2827035	2	0.2947774	5	0.2965047	10	0.2829101	50	0.3070486
Trichlorofluoromethane	0.5	0.416971	1	0.3982204	2	0.3933762	5	0.4166758	10	0.4147784	50	0.4348016
1,2,3-Trichloropropane	0.5	0.1553501	1	0.194716	2	0.2028956	5	0.1940141	10	0.1823599	50	0.2015194
1,3,5-Trimethylbenzene	0.5	2.37961	1	2.560007	2	2.564216	5	2.776931	10	2.687647	50	2.649595
1,2,4-Trimethylbenzene	0.5	2.324576	1	2.538502	2	2.671023	5	2.827844	10	2.781134	50	2.871801
1,1,2-Trichloro-1,2,2-trifluoroethan	0.5	0.265548	1	0.2391046	2	0.25175	5	0.2676589	10	0.2550244	50	0.2684934
Vinyl chloride	0.5	0.2899747	1	0.2730818	2	0.2695244	5	0.2566779	10	0.2618235	50	0.2605759
m,p-Xylene	1	2.250194	2	2.225457	4	2.351109	10	2.406089	20	2.27615	100	2.401383
o-Xylene	0.5	2.163284	1	2.276487	2	2.472804	5	2.459892	10	2.281776	50	2.454176

INITIAL CALIBRATION DATA

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Vinyl acetate	1	0.6022882	2	0.6334046	4	0.6793038	10	0.7026806	20	0.6770542	100	0.8047547
Xylenes (total)	1.5	2.221224	3	2.242467	6	2.391674	15	2.424023	30	2.278025	150	2.41898
Dibromofluoromethane	30	0.2934176	35	0.29319	40	0.3029947	50	0.3036766	60	0.2962756	70	0.3127558
1,2-Dichloroethane-d4	30	0.0573962	35	0.0605748	40	5.994985E-02	50	5.896501E-02	60	5.831832E-02	70	6.237847E-02
Toluene-d8	30	2.355215	35	2.275821	40	2.390339	50	2.257741	60	2.290148	70	2.343766
tert-Amyl alcohol	2.5	~~6.143872E-03~~	5	1.180444E-02	10	1.310155E-02	25	1.284541E-02	50	0.0119804	250	1.468073E-02
tert-Amyl ethyl ether	0.5	0.6679315	1	0.699564	2	0.7198658	5	0.7442697	10	0.7184505	50	0.7738991
1,3,5-Trichlorobenzene	0.5	0.8683111	1	0.9154919	2	0.9065368	5	0.9406861	10	0.9442469	50	1.003495
Diethyl ether	0.5	0.2245316	1	0.2495304	2	0.2644888	5	0.2570616	10	0.2473435	50	0.2652177

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Acetone	200	9 282955E-02	300	8 651215E-02	400	8 540897E-02						
Acetonitrile	1000	4 961416E-02	1500	4 655373E-02	2000	4 634497E-02						
Acrolein	500	4 812751E-02	750	4 617434E-02	1000	4 617991E-02						
Acrylonitrile	500	0 1180254	750	0 1121796	1000	0 1134751						
Benzene	100	1 184763	150	1 146622	200	1 155122						
Allyl chloride	100	0 1503125	150	0 1471866	200	0 144124						
Bromobenzene	100	0 9380966	150	0 9624694	200	0 9613015						
Bromochloromethane	100	0 1622264	150	0 1578463	200	0 1573072						
Tert-Amyl Methyl Ether	100	0 8411263	150	0 810526	200	0 8222346						
Bromodichloromethane	100	0 4179202	150	0 4149229	200	0 4041694						
Bromoform	100	0 5312979	150	0 5071055	200	0 5391845						
Bromomethane	100	0 2219676	150	0 2235105	200	0 2279026						
Bromofluorobenzene	30	0 89887	30	0 8893881	30	0 8958898						
n-Butylbenzene	100	2 549386	150	2 628477	200	2 576729						
2-Butanone	200	0 1522238	300	0 1418711	400	0 1496494						
sec-Butylbenzene	100	3 195958	150	3 223273	200	3 24307						
tert-Butylbenzene	100	2 423395	150	2 468662	200	2 447789						
Carbon disulfide	100	1 041083	150	1 045506	200	1 065434						
Carbon tetrachloride	100	0 327579	150	0 330072	200	0 3306442						
Chlorobenzene	100	1 877024	150	1 833574	200	1 897027						
Chloroethane	100	0 2128481	150	0 1990322	200	0 2102156						
Chloroform	100	0 5277651	150	0 517654	200	0 5051308						
2-Chloroethyl vinyl ether	200	0 2171079	300	0 2088902	400	0 2019659						
Chloromethane	100	0 3621478	150	0 3325033	200	0 3301123						
1-Chlorohexane	100	0 8493396	150	0 849812	200	0 8811586						
2-Chlorotoluene	100	2 55386	150	2 63474	200	2 446842						
Chloroprene	100	0 4708374	150	0 4702886	200	0 4710373						
4-Chlorotoluene	100	2 907837	150	3 042563	200	2 827681						
Cyclohexane	100	0 4697431	150	0 4611026	200	0 4776023						
Dibromochloromethane	100	0 8342198	150	0 8014912	200	0 8260145						
1,2-Dibromo-3-chloropropane	100	0 168283	150	0 1647303	200	0 1738606						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
1,2-Dibromoethane (EDB)	100	0 733189	150	0 7145276	200	0 7200631						
Dibromomethane	100	0 2063669	150	0 2064956	200	0 2049917						
1,2-Dichlorobenzene	100	1 507688	150	1 548241	200	1 554739						
1,3-Dichlorobenzene	100	1 598664	150	1 611554	200	1 610353						
trans-1,4-Dichloro-2-butene	100	0 3057808	150	0 2961556	200	0 2831471						
cis-1,4-Dichloro-2-butene	100	0 3324233	150	0 3132863	200	0 3087773						
1,4-Dichlorobenzene	100	1 626045	150	1 645661	200	1 647917						
Dichlorodifluoromethane	100	0 3194973	150	0 3271337	200	0 3293633						
1,1-Dichloroethane	100	0 5836923	150	0 5778347	200	0 5698118						
1,2-Dichloroethane	100	0 4230975	150	0 3912153	200	0 3926606						
1,1-Dichloroethene	100	0 2584342	150	0 2567619	200	0 2647181						
cis-1,2-Dichloroethene	100	0 3011446	150	0 2943625	200	0 3003822						
trans-1,2-Dichloroethene	100	0 286164	150	0 2795517	200	0 2845234						
1,2-Dichloroethene (total)	200	0 2936543	300	0 2869571	400	0 2924528						
1,2-Dichloropropane	100	0 3372724	150	0 33435	200	0 3231754						
1,3-Dichloropropane	100	1 186652	150	1 090113	200	1 125927						
2,2-Dichloropropane	100	0 3684007	150	0 3593533	200	0 3582942						
1,1-Dichloropropene	100	0 3970585	150	0 3831965	200	0 396473						
cis-1,3-Dichloropropene	100	0 4885698	150	0 4798373	200	0 4652077						
trans-1,3-Dichloropropene	100	1 168948	150	1 117676	200	1 101605						
Diisopropyl Ether	100	1 254945	150	1 200033	200	1 165689						
1,4-Dioxane	2000	2 258119E-03	3000	2 375356E-03	4000	2 395579E-03						
Ethylbenzene	100	3 282727	150	3 246826	200	3 228777						
Ethyl tert-Butyl Ether	100	0 9540225	150	0 9051832	200	0 9101343						
Ethyl Methacrylate	100	0 9995847	150	0 9262446	200	0 9337086						
Hexachlorobutadiene	100	0 3288569	150	0 3490013	200	0 3605733						
Hexane	100	0 2439637	150	0 24065	200	0 2471915						
2-Hexanone	200	0 5512147	300	0 4993832	400	0 5051508						
Iodomethane	100	0 4738711	150	0 4674106	200	0 4699432						
Isobutyl alcohol	2000	6 696845E-03	3000	6 279476E-03	4000	6 47642E-03						
Isopropylbenzene	100	2 649415	150	2 628486	200	2 661888						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
p-Isopropyltoluene	100	2 648786	150	2 674252	200	2 707774						
Methacrylonitrile	1000	0 2020869	1500	0 1838245	2000	0 1750524						
Methylene chloride	100	0 3161168	150	0 3146965	200	0 3099723						
Methyl Acetate	100	0 2413676	150	0 2302899	200	0 2299943						
Methylcyclohexane	100	0 3555269	150	0 3571934	200	0 3714761						
Naphthalene	100	2 320791	150	2 352224	200	2 348603						
Methyl Methacrylate	100	0 2911209	150	0 2839692	200	0 276931						
4-Methyl-2-pentanone	200	0 3168036	300	0 2937317	400	0 28732						
Methyl t-Butyl Ether	100	0 7654426	150	0 7301802	200	0 7446146						
n-Propylbenzene	100	4 151096	150	4 29151	200	4 032419						
Propionitrile	1000	4 049742E-02	1500	3 820729E-02	2000	3 867065E-02						
Styrene	100	1 952602	150	1 922057	200	1 896185						
1,1,2,2-Tetrachloroethane	100	1 03476	150	1 026189	200	1 014841						
1,1,1,2-Tetrachloroethane	100	0 6779892	150	0 6634943	200	0 6752347						
tert-Butyl alcohol	500	1 851743E-02	750	1 880917E-02	1000	1 920266E-02						
Tetrachloroethene	100	0 6573511	150	0 6594215	200	0 6741881						
Toluene	100	1 638846	150	1 606107	200	1 608109						
1,2,3-Trichlorobenzene	100	0 8125295	150	0 8551652	200	0 8541908						
1,2,4-Trichlorobenzene	100	0 9320866	150	0 9832025	200	0 9694241						
1,1,2-Trichloroethane	100	0 5901315	150	0 5474965	200	0 5742418						
1,1,1-Trichloroethane	100	0 3847175	150	0 3797984	200	0 3783605						
Tetrahydrofuran	100	3 045887E-02	150	2 932671E-02	200	3 005084E-02						
Trichloroethene	100	0 2921799	150	0 2883927	200	0 2897888						
Trichlorofluoromethane	100	0 4069233	150	0 4090056	200	0 3986126						
1,2,3-Trichloropropane	100	0 2124545	150	0 1993023	200	0 2047064						
1,3,5-Trimethylbenzene	100	2 670444	150	2 76717	200	2 602445						
1,2,4-Trimethylbenzene	100	2 774473	150	2 782094	200	2 727828						
1,1,2-Trichloro-1,2,2-trifluoroethan	100	0 2526686	150	0 2633517	200	0 2663041						
Vinyl chloride	100	0 2462295	150	0 2288503	200	0 2117229						
m,p-Xylene	200	2 448334	300	2 310545	400	2 051806						
o-Xylene	100	2 545066	150	2 41742	200	2 415451						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF	ug/L	RF
Vinyl acetate	200	0 7549232	300	0 7038911	400	0 7057329						
Xylenes (total)	300	2 480579	450	2 34617	600	2 17302						
Dibromofluoromethane	30	0 2897069	30	0 2875421	30	0 2821717						
1,2-Dichloroethane-d4	30	5 765608E-02	30	5 641305E-02	30	5 694538E-02						
Toluene-d8	30	2 343034	30	2 285149	30	2 340447						
tert-Amyl alcohol	500	1 471725E-02	750	1 441386E-02	1000	1 539262E-02						
tert-Amyl ethyl ether	100	0 7805044	150	0 7571618	200	0 7401372						
1,3,5-Trichlorobenzene	100	0 996872	150	1 042883	200	1 039499						
Diethyl ether	100	0 2600831	150	0 2474117	200	0 2491254						

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
Acetone	9 925274E-02	18 65927	3 5425	0 2000425		0 9996475	0 99	
Acetonitrile	5 215627E-02	12 07755	3 62	0 3297434			15	
Acrolein	4 498567E-02	6 112606	3 431111	9 585575E-02			15	
Acrylonitrile	0 116364	5 358877	4 356667	0 1151047			15	
Benzene	1 154194	1 7061	7 435556	7 072784E-02			15	
Allyl chloride	0 1472546	1 929598	4 428889	0 1358167			15	
Bromobenzene	0 9079025	4 467168	12 18222	2 977815E-02			15	
Bromochloromethane	0 1560264	4 24413	6 526667	7 694252E-02			15	
Tert-Amyl Methyl Ether	0 7695592	6 714938	7 631111	3 994028E-02			15	
Bromodichloromethane	0 3998522	4 552161	8 425556	6 073196E-02			15	
Bromoform	0 4563323	12 74347	11 59222	4 387294E-02			SPCC (0 1)	
Bromomethane	0 2314666	6 824667	2 658889	0 1263134			15	
Bromofluorobenzene	0 8952428	2 475263	12 02111	2 185397E-02			15	
n-Butylbenzene	2 489868	5 616833	13 62111	2 143671E-02			15	
2-Butanone	0 1534934	7 021182	5 977778	0 109532			15	
sec-Butylbenzene	3 173939	5 271238	13 08	1 342399E-02			15	
tert-Butylbenzene	2 3912	4 627122	12 84333	3 785047E-02			15	
Carbon disulfide	1 048635	1 908311	4 524445	0 1160971			15	
Carbon tetrachloride	0 3165375	5 112765	7 404444	7 084457E-02			15	
Chlorobenzene	1 812168	3 52607	10 87	0 0096915			SPCC (0 3)	
Chloroethane	0 2136303	4 297378	2 782222	0 2392006			15	
Chloroform	0 5361618	4 860803	6 5	0			CCC (30)	
2-Chloroethyl vinyl ether	0 1986566	8 504609	8 794445	5 929322E-02			15	
Chloromethane	0 3564781	5 96505	2 108889	0 1561817			SPCC (0 1)	
1-Chlorohexane	0 8722052	4 878924	10 84	1 786213E-02			15	
2-Chlorotoluene	2 542961	2 773786	12 40778	4 098919E-02			15	
Chloroprene	0 473218	3 880128	5 796667	8 860879E-02			15	
4-Chlorotoluene	2 956332	2 360422	12 46778	3 018017E-02			15	
Cyclohexane	0 4887932	4 481529	7 334444	7 071903E-02			15	
Dibromochloromethane	0 7453388	9 321401	10 1	1 507238E-02			15	
1,2-Dibromo-3-chloropropane	0 1515294	10 69008	14 21556	3 636273E-02			15	
1,2-Dibromoethane (EDB)	0 6817428	5 993181	10 31444	5 386536E-02			15	

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
Dibromomethane	0 2022788	4 740746	8 361111	4 164846E-02			15	
1,2-Dichlorobenzene	1 488315	3 930989	13 57111	3 015807E-02			15	
1,3-Dichlorobenzene	1 574402	2 621158	13 16333	3 490958E-02			15	
trans-1,4-Dichloro-2-butene	0 288042	4 519212	11 99333	4 574981E-02			15	
cis-1,4-Dichloro-2-butene	0 3078219	7 728109	11 67778	3 983526E-02			15	
1,4-Dichlorobenzene	1 62154	2 360391	13 25556	3 981996E-02			15	
Dichlorodifluoromethane	0 3054404	11 29956	1 91	9 090674E-03			15	
1,1-Dichloroethane	0 5797153	3 23659	5 528889	5 971154E-02			SPCC (0 1)	
1,2-Dichloroethane	0 4226817	5 40424	7 268889	4 934051E-02			15	
1,1-Dichloroethene	0 255295	3 295482	3 988889	8 388359E-02			CCC (30)	
cis-1,2-Dichloroethene	0 3007548	2 10223	6 245555	8 302949E-02			15	
trans-1,2-Dichloroethene	0 2852309	1 670137	5 151111	6 491232E-02			15	
1,2-Dichloroethene (total)	0 2929928	1 515537	6 245555	8 302949E-02			15	
1,2-Dichloropropane	0 3355279	3 28399	8 25	0			CCC (30)	
1,3-Dichloropropane	1 130723	3 205363	9 843334	4 786824E-02			15	
2,2-Dichloropropane	0 3720635	3 625106	6 35	1 141828E-02			15	
1,1-Dichloropropene	0 4038581	3 624391	7 286667	6 865682E-02			15	
cis-1,3-Dichloropropene	0 458124	5 488344	9 004445	0 0600887			15	
trans-1,3-Dichloropropene	1 095541	5 249786	9 482222	4 737026E-02			15	
Diisopropyl Ether	1 226829	4 202699	5 903333	8 410343E-02			15	
1,4-Dioxane	2 126013E-03	10 21515	8 41	5 726314E-02			15	
Ethylbenzene	3 111334	5 540005	11 01556	4 736199E-02			CCC (30)	
Ethyl tert-Butyl Ether	0 9249174	4 265652	6 374444	0 0820257			15	
Ethyl Methacrylate	0 8790471	9 840225	9 675556	5 660742E-02			15	
Hexachlorobutadiene	0 3368685	4 570735	15 57667	3 645898E-02			15	
Hexane	0 2530745	4 184833	5 745555	9 184151E-02			15	
2-Hexanone	0 4972723	8 184429	9 783333	4 939024E-02			15	
Iodomethane	0 3954725	18 33022	4 18	0 1201654	0 9998702		0 995	
Isobutyl alcohol	5 998497E-03	10 00389	6 597778	0 1249643			15	
Isopropylbenzene	2 502289	6 401885	11 91556	4 185844E-02			15	
p-Isopropyltoluene	2 607019	3 584118	13 21556	3 893935E-02			15	
Methacrylonitrile	0 2034313	7 93893	6 152222	0 1588659			15	

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
Methylene chloride	0 3507173	15 91364	4 47375	0 1154095	0 9998922		0 995	
Methyl Acetate	0 2499245	7 279515	4 34	0 1632771			15	
Methylcyclohexane	0 3602593	4 222056	8 578889	4 339208E-02			15	
Naphthalene	2 064786	13 38599	15 44444	3 503142E-02			15	
Methyl Methacrylate	0 2797967	3 722796	8 39	1 025805E-02			15	
4-Methyl-2-pentanone	0 2983246	5 596368	8 931111	3 380081E-02			15	
Methyl t-Butyl Ether	0 7311503	4 150182	5 14	1 963738E-02			15	
n-Propylbenzene	4 070073	3 837448	12 32667	4 234482E-02			15	
Propionitrile	3 843911E-02	6 668384	5 701111	5 818702E-02			15	
Styrene	1 784203	7 559871	11 49	9 615039E-03			15	
1,1,2,2-Tetrachloroethane	1 005694	5 294242	11 84333	4 684806E-02			SPCC (0 3)	
1,1,1,2-Tetrachloroethane	0 6216709	7 752431	10 91111	5 574867E-02			15	
tert-Butyl alcohol	1 831982E-02	7 909541	4 13	0 1192402			15	
Tetrachloroethene	0 6375083	5 358077	10 21222	4 397631E-02			15	
Toluene	1 618141	2 646049	9 477777	4 798943E-02			CCC (30)	
1,2,3-Trichlorobenzene	0 7571356	10 89742	15 73111	2 613124E-02			15	
1,2,4-Trichlorobenzene	0 8753412	9 313065	15 29444	3 784848E-02			15	
1,1,2-Trichloroethane	0 5613469	3 860112	9 634445	5 198648E-02			15	
1,1,1-Trichloroethane	0 3797739	3 958374	7 061111	4 297158E-02			15	
Tetrahydrofuran	2 842628E-02	8 368535	6 70875	0 124089			15	
Trichloroethene	0 2905761	2 845392	8 202222	5 422861E-02			15	
Trichlorofluoromethane	0 4099294	3 093265	3 25	0 1535836			15	
1,2,3-Trichloropropane	0 1941465	8 635397	11 96778	2 852641E-02			15	
1,3,5-Trimethylbenzene	2 628674	4 628254	12 50556	4 265719E-02			15	
1,2,4-Trimethylbenzene	2 699919	6 325916	12 87444	4 522135E-02			15	
1,1,2-Trichloro-1,2,2-trifluoroethane	0 2588782	3 825001	4 07	5 552461E-03			15	
Vinyl chloride	0 2553845	9 259851	2 244444	0 2348668			CCC (30)	
m,p-Xylene	2 302341	5 239544	11 12889	2 558724E-02			15	
o-Xylene	2 387373	5 070778	11 52	2 454089E-02			15	
Vinyl acetate	0 6960037	8 626479	5 607778	7 801015E-02			15	
Xylenes (total)	2 330685	4 559206	11 52	2 454089E-02			15	
Dibromofluoromethane	0 2957479	3 174259	6 674444	7 784365E-02			15	

INITIAL CALIBRATION DATA (Continued)

SW8260B

Laboratory: Empirical Laboratories, LLC
SDG: 1312159
Client: CH2M Hill, Inc.
Project: St. Louis Ordnance Plant
Calibration: 3361001
Instrument: MS-VOA4
Matrix: Water
Calibration Dates: 12/24/13 7:37 12/24/13 11:19

Compound	Mean RF	RF RSD	Mean RT	RT RSD	Linear r	Quad COD	LIMIT	Q
1,2-Dichloroethane-d4	5 873302E-02	3 292316	7 174444	7 431263E-02			15	
Toluene-d8	2 320184	1 905354	9 403333	5 272532E-02			15	
tert-Amyl alcohol	1 361703E-02	9 990408	6 8725	6 805607E-02			15	
tert-Amyl ethyl ether	0 7335316	4 921162	8 524445	6 181594E-02			15	
1,3,5-Trichlorobenzene	0 9620024	6 394421	14 74222	3 000014E-02			15	
Diethyl ether	0 2516438	4 931652	3 646667	0 1357806			15	

INITIAL CALIBRATION CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Instrument ID:	MS-VOA6	Calibration:	3352001
Lab File ID:	1216ICV1.D	Calibration Date:	12/16/13 07:39
Sequence:	3L35205	Injection Date:	12/16/13
Lab Sample ID:	3L35205-ICV1	Injection Time:	12:15

		CONC. (ug/L)		RESPONSE FACTOR			% DIFF / DRIFT	
COMPOUND	TYPE	STD	ICV	ICAL	ICV	MIN (#)	ICV	LIMIT (#)
Benzene	A	50.00	52.33	1.009034	1.056002		4.7	20
Carbon tetrachloride	A	50.00	49.91	0.4748804	0.4740707		-0.2	20
Chloroform	A	50.00	46.69	0.6152241	0.5745107		-6.6	20
1,2-Dichloroethane	A	50.00	46.97	0.6785732	0.6374698		-6.1	20
cis-1,2-Dichloroethene	A	50.00	52.26	0.2770001	0.2894938		4.5	20
trans-1,2-Dichloroethene	A	50.00	51.74	0.2574982	0.2664364		3.5	20
Methylene chloride	A	50.00	46.79	0.3040354	0.2845066		-6.4	20
Naphthalene	Q	50.00	53.34	1.719199	2.075041		6.7	20
1,1,2,2-Tetrachloroethane	A	50.00	53.94	0.7443614	0.8030801	0.3	7.9	20
1,1,1,2-Tetrachloroethane	A	50.00	53.34	0.6475189	0.6907515		6.7	20
Tetrachloroethene	A	50.00	52.93	0.6044864	0.6398722		5.9	20
1,1,2-Trichloroethane	A	50.00	55.19	0.4199956	0.463585		10.4	20
Trichloroethene	A	50.00	51.10	0.3054782	0.3122094		2.2	20
Vinyl chloride	A	50.00	51.75	0.3359195	0.3476741		3.5	20
Bromofluorobenzene	A	30.00	29.52	0.9659739	0.9504561		-1.6	20
Dibromofluoromethane	A	30.00	28.26	0.346217	0.3261409		-5.8	20
1,2-Dichloroethane-d4	A	30.00	29.62	6.331399E-02	6.250282E-02		-1.3	20
Toluene-d8	A	30.00	30.76	2.099642	2.153026		2.5	20

INITIAL CALIBRATION CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Instrument ID:	MS-VOA4	Calibration:	3361001
Lab File ID:	1224ICV1.D	Calibration Date:	12/24/13 07:37
Sequence:	3L35804	Injection Date:	12/24/13
Lab Sample ID:	3L35804-ICV1	Injection Time:	12:14

		CONC. (ug/L)		RESPONSE FACTOR			% DIFF / DRIFT	
COMPOUND	TYPE	STD	ICV	ICAL	ICV	MIN (#)	ICV	LIMIT (#)
Benzene	A	50.00	53.10	1.154194	1.22568		6.2	20
Carbon tetrachloride	A	50.00	53.19	0.3165375	0.3367592		6.4	20
Chloroform	A	50.00	49.09	0.5361618	0.5263817		-1.8	20
1,2-Dichloroethane	A	50.00	49.45	0.4226817	0.418037		-1.1	20
cis-1,2-Dichloroethene	A	50.00	52.05	0.3007548	0.3130985		4.1	20
trans-1,2-Dichloroethene	A	50.00	53.20	0.2852309	0.3034673		6.4	20
Methylene chloride	L	50.00	52.42	0.3507173	0.3310533		4.8	20
Naphthalene	A	50.00	58.03	2.064786	2.396575		16.1	20
1,1,2,2-Tetrachloroethane	A	50.00	51.55	1.005694	1.03696	0.3	3.1	20
1,1,1,2-Tetrachloroethane	A	50.00	53.16	0.6216709	0.6609882		6.3	20
Tetrachloroethene	A	50.00	54.39	0.6375083	0.6934542		8.8	20
1,1,2-Trichloroethane	A	50.00	52.93	0.5613469	0.5942406		5.9	20
Trichloroethene	A	50.00	54.37	0.2905761	0.315988		8.7	20
Vinyl chloride	A	50.00	52.23	0.2553845	0.2667888		4.5	20
Bromofluorobenzene	A	30.00	29.15	0.8952428	0.8699343		-2.8	20
Dibromofluoromethane	A	30.00	29.54	0.2957479	0.2912007		-1.5	20
1,2-Dichloroethane-d4	A	30.00	31.30	5.873302E-02	6.126893E-02		4.3	20
Toluene-d8	A	30.00	30.17	2.320184	2.333631		0.6	20

CONTINUING CALIBRATION CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Instrument ID:	MS-VOA4	Calibration:	3361001
Lab File ID:	1227CCV1.D	Calibration Date:	12/24/13 07:37
Sequence:	3L36403	Injection Date:	12/27/13
Lab Sample ID:	3L36403-CCV1	Injection Time:	07:07

		CONC. (ug/L)		RESPONSE FACTOR			% DIFF / DRIFT	
COMPOUND	TYPE	STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Benzene	A	100.0	87.36	1.154194	1.008298		-12.6	20
Carbon tetrachloride	A	100.0	91.72	0.3165375	0.2903376		-8.3	20
Chloroform	A	100.0	81.72	0.5361618	0.438144		-18.3	20
1,2-Dichloroethane	A	100.0	88.14	0.4226817	0.3725377		-11.9	20
cis-1,2-Dichloroethene	A	100.0	86.97	0.3007548	0.2615782		-13.0	20
trans-1,2-Dichloroethene	A	100.0	85.50	0.2852309	0.2438772		-14.5	20
Methylene chloride	L	100.0	86.52	0.3507173	0.271517		-13.5	20
Naphthalene	A	100.0	99.91	2.064786	2.062976		-0.09	20
1,1,2,2-Tetrachloroethane	A	100.0	93.32	1.005694	0.9384833	0.3	-6.7	20
1,1,1,2-Tetrachloroethane	A	100.0	91.61	0.6216709	0.5695395		-8.4	20
Tetrachloroethene	A	100.0	89.60	0.6375083	0.5712273		-10.4	20
1,1,2-Trichloroethane	A	100.0	90.88	0.5613469	0.5101343		-9.1	20
Trichloroethene	A	100.0	85.75	0.2905761	0.2491573		-14.3	20
Vinyl chloride	A	100.0	80.91	0.2553845	0.2066415		-19.1	20
Bromofluorobenzene	A	30.00	28.09	0.8952428	0.8382794		-6.4	20
Dibromofluoromethane	A	30.00	28.54	0.2957479	0.2813901		-4.9	20
1,2-Dichloroethane-d4	A	30.00	29.90	5.873302E-02	5.853529E-02		-0.3	20
Toluene-d8	A	30.00	29.53	2.320184	2.283788		-1.6	20

CONTINUING CALIBRATION CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Instrument ID:	MS-VOA6	Calibration:	3352001
Lab File ID:	1227CCV1.D	Calibration Date:	12/16/13 07:39
Sequence:	3L36510	Injection Date:	12/27/13
Lab Sample ID:	3L36510-CCV1	Injection Time:	06:17

		CONC. (ug/L)		RESPONSE FACTOR			% DIFF / DRIFT	
COMPOUND	TYPE	STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Benzene	A	100.0	101.3	1.009034	1.021926		1.3	20
Carbon tetrachloride	A	100.0	100.1	0.4748804	0.475358		0.1	20
Chloroform	A	100.0	90.26	0.6152241	0.5553051		-9.7	20
1,2-Dichloroethane	A	100.0	92.78	0.6785732	0.6295673		-7.2	20
cis-1,2-Dichloroethene	A	100.0	101.9	0.2770001	0.2822906		1.9	20
trans-1,2-Dichloroethene	A	100.0	98.64	0.2574982	0.2539975		-1.4	20
Methylene chloride	A	100.0	89.23	0.3040354	0.271294		-10.8	20
Naphthalene	Q	100.0	93.79	1.719199	1.913375		-6.2	20
1,1,2,2-Tetrachloroethane	A	100.0	98.82	0.7443614	0.7355852	0.3	-1.2	20
1,1,1,2-Tetrachloroethane	A	100.0	99.71	0.6475189	0.6456499		-0.3	20
Tetrachloroethene	A	100.0	97.09	0.6044864	0.5868802		-2.9	20
1,1,2-Trichloroethane	A	100.0	100.8	0.4199956	0.4231919		0.8	20
Trichloroethene	A	100.0	98.37	0.3054782	0.3005117		-1.6	20
Vinyl chloride	A	100.0	93.42	0.3359195	0.3138079		-6.6	20
Bromofluorobenzene	A	30.00	29.53	0.9659739	0.9509616		-1.6	20
Dibromofluoromethane	A	30.00	29.47	0.346217	0.340067		-1.8	20
1,2-Dichloroethane-d4	A	30.00	30.21	6.331399E-02	0.0637497		0.7	20
Toluene-d8	A	30.00	29.68	2.099642	2.077397		-1.1	20

CONTINUING CALIBRATION CHECK

SW8260B

Laboratory:	Empirical Laboratories, LLC	SDG:	1312159
Client:	CH2M Hill, Inc.	Project:	St. Louis Ordnance Plant
Instrument ID:	MS-VOA4	Calibration:	3361001
Lab File ID:	1231CC1.D	Calibration Date:	12/24/13 07:37
Sequence:	4A00204	Injection Date:	12/31/13
Lab Sample ID:	4A00204-CCV1	Injection Time:	10:46

		CONC. (ug/L)		RESPONSE FACTOR			% DIFF / DRIFT	
COMPOUND	TYPE	STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Benzene	A	100.0	103.6	1.154194	1.19547		3.6	20
Carbon tetrachloride	A	100.0	112.9	0.3165375	0.3573681		12.9	20
Chloroform	A	100.0	98.96	0.5361618	0.5305696		-1.0	20
1,2-Dichloroethane	A	100.0	95.75	0.4226817	0.4047024		-4.3	20
cis-1,2-Dichloroethene	A	100.0	103.5	0.3007548	0.3111817		3.5	20
trans-1,2-Dichloroethene	A	100.0	106.2	0.2852309	0.3028423		6.2	20
Methylene chloride	L	100.0	101.2	0.3507173	0.3171321		1.2	20
Naphthalene	A	100.0	104.3	2.064786	2.153922		4.3	20
1,1,2,2-Tetrachloroethane	A	100.0	96.67	1.005694	0.9722043	0.3	-3.3	20
1,1,1,2-Tetrachloroethane	A	100.0	107.9	0.6216709	0.6705427		7.9	20
Tetrachloroethene	A	100.0	111.6	0.6375083	0.7115374		11.6	20
1,1,2-Trichloroethane	A	100.0	100.0	0.5613469	0.561487		0.02	20
Trichloroethene	A	100.0	106.1	0.2905761	0.3082208		6.1	20
Vinyl chloride	A	100.0	96.08	0.2553845	0.2453749		-3.9	20
Bromofluorobenzene	A	30.00	29.15	0.8952428	0.8699716		-2.8	20
Dibromofluoromethane	A	30.00	28.70	0.2957479	0.2829639		-4.3	20
1,2-Dichloroethane-d4	A	30.00	29.00	5.873302E-02	5.676876E-02		-3.3	20
Toluene-d8	A	30.00	29.32	2.320184	2.267415		-2.3	20

HOLDING TIME SUMMARY

SW8260B

Laboratory: Empirical Laboratories, LLC SDG: 1312159

Client: CH2M Hill, Inc. Project: St. Louis Ordnance Plant

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-124-121913	12/19/13 08:59	12/20/13 12:20	12/31/13 15:00	N/A	14.00	12/31/13 15:00	12.25	14.00	
MW-123-121913	12/19/13 09:10	12/20/13 12:20	12/27/13 12:12	N/A	14.00	12/27/13 12:12	8.13	14.00	
MW-124S-121913	12/19/13 09:51	12/20/13 12:20	12/27/13 12:40	N/A	14.00	12/27/13 12:40	8.12	14.00	
MW-123S-121913	12/19/13 09:55	12/20/13 12:20	12/27/13 13:08	N/A	14.00	12/27/13 13:08	8.13	14.00	
MW-122S-121913	12/19/13 10:58	12/20/13 12:20	12/27/13 13:35	N/A	14.00	12/27/13 13:35	8.11	14.00	
MW-122-121913	12/19/13 11:00	12/20/13 12:20	12/27/13 14:03	N/A	14.00	12/27/13 14:03	8.13	14.00	
Trip Blank #02691	12/19/13 12:40	12/20/13 12:20	12/27/13 09:58	N/A	14.00	12/27/13 09:58	7.89	14.00	

PREPARATION BENCH SHEET

3L27001

Empirical Laboratories, LLC

Printed: 1/8/2014 2:51:37PM

Instrument: VOA6

Matrix: Water **Prepared using: MS - 5030B** **Surrogate used: 13K0592**

Lab Number	Cont ID	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	PH	Extraction Comments
1312151-06RE1	B	VOC_8260B_REG	12/27/2013	5	5				1	2	Re-extract added 12/27/2013 by ADM-RR 20X lower
1312151-07RE1	B	VOC_8260B_REG	12/27/2013	5	5				1	2	Re-extract added 12/27/2013 by ADM-RR 20X lower
1312152-03	B	VOC_8260B_REG	12/27/2013	5	5				1	2	IStoICAL-2X-M/F
1312152-09	A	VOC_8260B_REG	12/27/2013	5	5				1	2	TB
1312156-01	A	VOC_8260B_REG	12/27/2013	5	5				1	2	TB
1312156-02	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions
1312156-03	B	VOC_8260B_REG	12/27/2013	5	5				1	2	MS/MSD
1312156-04	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-2X-F
1312156-05	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-10X-T
1312156-06	A	VOC_8260B_REG	12/27/2013	5	5				1	2	EB
1312156-07	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-500X-T/F
1312156-08	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-100X-T/F
1312156-09	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-10X-T
1312156-10	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-10X-T
1312156-11	B	VOC_8260B_REG	12/27/2013	5	5				1	2	see versions-2000X-T/F
1312159-01	B	VOC_8260B_REG	12/27/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312159-07	A	VOC_8260B_REG	12/27/2013	5	5				1	2	TB
1312160-02	B	VOC_8260B_REG	12/27/2013	5	5				1	2	TCL list-2X-heavy foam
3L27001-BLK1		QC	12/27/2013	5	5				1	NA	
3L27001-BS1		QC	12/27/2013	5	5	13L0538		2.5	1	NA	
3L27001-MS1		QC	12/27/2013	5	5	13L0538	1312156-03	2.5	1	NA	
3L27001-MSD1		QC	12/27/2013	5	5	13L0538	1312156-03	2.5	1	NA	

PREPARATION BENCH SHEET

3L27001

Empirical Laboratories, LLC

Printed: 1/8/2014 2:51:37PM

Instrument: VOA6

Matrix: Water **Prepared using: MS - 5030B** **Surrogate used: 13K0592**

Lab Number	Cont ID	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	PH	Extraction Comments

Reagents Used:

Standard	Description
12A0500	Anti-foam-GE_AF72

PREPARATION BENCH SHEET

3L27003

Empirical Laboratories, LLC

Printed: 1/7/2014 10:12:30AM

Instrument: VOA4

Matrix: Water **Prepared using: MS - 5030B** **Surrogate used: 13K0592**

Lab Number	Cont ID	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	PH	Extraction Comments
1312103-01	A	VOC_TCLP_8260B	12/27/2013	5	5				1	7	10X-TCLP
1312135-02	A	VOC_8260B_REG	12/27/2013	5	5				1	7	Added for BatchQC in: 3L27003
1312135-02	A	VOC_TCLP_8260B	12/27/2013	5	5				1	7	10X-TCLP
1312157-01	A	VOC_8260B_REG	12/27/2013	5	5				1	2	TB
1312157-02	B	VOC_8260B_REG	12/27/2013	5	5				1	2	naphthalene must be reported / IS-ICAL
1312157-04	B	VOC_8260B_REG	12/27/2013	5	5				1	2	naphthalene must be reported / IS-ICAL
1312159-02	B	VOC_8260B_REG	12/27/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312159-03	B	VOC_8260B_REG	12/27/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312159-04	B	VOC_8260B_REG	12/27/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312159-05	B	VOC_8260B_REG	12/27/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312159-06	B	VOC_8260B_REG	12/27/2013	5	5				1	2	See versions. lowMDLs. DIL Approval Required
1312162-01	B	VOC_8260B_REG	12/27/2013	5	5				1	2	select version-100X-T/F
1312164-01	B	VOC_8260B_REG	12/27/2013	5	5				1	2	select version
1312168-01	B	VOC_8260B_REG	12/27/2013	5	5				1	2	select version
1312168-02	B	VOC_8260B_REG	12/27/2013	5	5				1	2	select version
1312168-03	B	VOC_8260B_REG	12/27/2013	5	5				1	2	select version
1312168-04	B	VOC_8260B_REG	12/27/2013	5	5				1	2	select version
1312168-05	B	VOC_8260B_REG	12/27/2013	5	5				1	2	select version
1312168-07	B	VOC_8260B_REG	12/27/2013	5	5				1	2	select version-2X-F
3L27003-BLK1		QC	12/27/2013	5	5				1	NA	
3L27003-BS1		QC	12/27/2013	5	5	13L0538		2.5	1	NA	
3L27003-MS1		QC	12/27/2013	5	5	13L0538	1312135-02	25	1	NA	10X

PREPARATION BENCH SHEET

3L27003

Empirical Laboratories, LLC

Printed: 1/7/2014 10:12:30AM

Instrument: VOA4

Matrix: Water **Prepared using: MS - 5030B** **Surrogate used: 13K0592**

Lab Number	Cont ID	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	PH	Extraction Comments
3L27003-MSD1		QC	12/27/2013	5	5	13L0538	1312135-02	25	1	NA	10X

Reagents Used:

Standard	Description
12A0500	Anti-foam-GE_AF72

PREPARATION BENCH SHEET

3L31010

Empirical Laboratories, LLC

Printed: 1/8/2014 3:05:51PM

Instrument: VOA4

Matrix: Water **Prepared using: MS - 5030B** **Surrogate used: 13K0592**

Lab Number	Cont ID	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	PH	Extraction Comments
1312156-04RE1	C	VOC_8260B_REG	12/31/2013	5	5				1	2	RR 5x OLR VC
1312156-11RE1	C	VOC_8260B_REG	12/31/2013	5	5				1	2	RR 5000x OLR TCE
1312159-01RE1	C	VOC_8260B_REG	12/31/2013	5	5				1	2	RR 1x carryover-low MDL VC
1312160-01	A	VOC_8260B_REG	12/31/2013	5	5				1	7	Added for BatchQC in: 3L31010
1312160-01	A	VOC_TCLP_8260B	12/31/2013	5	5				1	7	10x
1312160-02RE1	C	VOC_8260B_REG	12/31/2013	5	5				1	2	RR 20x-M
1312170-10RE1	C	VOC_8260B_REG	12/31/2013	5	5				1	2	RR200x OLR TCE
1312171-01	B	VOC_TCLP_8260B	12/31/2013	5	5				1	7	250x
1312174-01	A	VOC_8260B_REG	12/31/2013	5	5				1	7	
1312174-02	A	VOC_8260B_REG	12/31/2013	5	5				1	7	
1312174-04	A	VOC_8260B_REG	12/31/2013	5	5				1	7	
1312175-02	B	VOC_8260B_REG	12/31/2013	5	5				1	2	MS/MSD
1312175-02	B	VOC_TCLP_8260B	12/31/2013	5	5				1	2	Added for BatchQC in: 3L31010
1312182-01	B	VOC_8260B_REG	12/31/2013	5	5				1	2	select version 2.5x-T
3L31010-BLK1		QC	12/31/2013	5	5				1	NA	
3L31010-BS1		QC	12/31/2013	5	5	13L0632		2.5	1	NA	
3L31010-MS1		QC	12/31/2013	5	5	13L0632	1312175-02	2.5	1	NA	
3L31010-MS2		QC	12/31/2013	5	5	13L0632	1312160-01	25	1	NA	10x
3L31010-MSD1		QC	12/31/2013	5	5	13L0632	1312175-02	2.5	1	NA	
3L31010-MSD2		QC	12/31/2013	5	5	13L0632	1312160-01	25	1	NA	10x

PREPARATION BENCH SHEET

3L31010

Empirical Laboratories, LLC

Printed: 1/8/2014 3:05:51PM

Instrument: VOA4

Matrix: Water **Prepared using: MS - 5030B** **Surrogate used: 13K0592**

Lab Number	Cont ID	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	PH	Extraction Comments

Reagents Used:

Standard	Description
12A0500	Anti-foam-GE_AF72

ANALYTICAL REPORT

For:

St. Louis Ordinance

ASL Report #: N1077

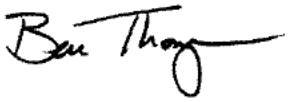
Project ID: 459603.01.VI.RS.02

Attn: Anthony Swierczek/STL

cc:

Shane Lowe/STL

Authorized and Released By:



Laboratory Project Manager
Ben Thompson
(541) 758-0235 ext.23132

February 11, 2014

All analyses performed by CH2M HILL are clearly indicated. Any subcontracted analyses are included as appended reports as received from the subcontracted laboratory. The results included in this report only relate to the samples listed on the following Sample Cross-Reference page. This report shall not be reproduced except in full, without the written approval of the laboratory.

Any unusual difficulties encountered during the analysis of your samples are discussed in the attached case narratives.

Accredited in accordance with NELAP:
Oregon (100022)
Arizona (0771)
Louisiana (05031)

Sample Receipt Comments

We certify that the test results meet all NELAP requirements.

Sample Cross-Reference

ASL Sample ID	Client Sample ID	Date/Time Collected	Date Received
N107701	PP03-SG-01-011314	01/13/14 10:56	01/17/14
N107702	PP03-IA-01-011314	01/13/14 10:57	01/17/14
N107703	PP03-AA-01-011314	01/13/14 11:00	01/17/14

Table of Contents

Page

CH2M HILL
Applied Sciences Laboratory (ASL)
1100 NE Circle Blvd
Suite 300
Corvallis OR 97330
Tel 541.768.3120
Fax 541.752 0276

DOD Data Qualifiers

U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the LOD.
J	The analyte was positively identified but the associated numerical value is below the LOQ.
J	The analyte was positively identified, the quantitation is an estimation.
Q	The data must be evaluated for usability due to deficiencies in the ability to analyze the sample and meet QC criteria.
B	The analyte was found in an associated blank, as well as in the sample.
M	A matrix effect was present.
S	To be applied to all field screening data.
T	Tentatively identified compounds (using GC/MS).
UJ	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ANALYSIS METHOD

TO15 SIM

CH2MHILL
Applied Sciences Laboratory (ASL)

1100 NE Circle Blvd., Suite 300
Corvallis, OR 97330
Tel 541-768-3120 Fax 541-752-0276

CASE NARRATIVE
GC/MS VOLATILES ANALYSIS

Lab Name: CH2M HILL ASL **ASL SDG#:** N1077

Project: St. Louis Ordinance **Project #:** 459603.01.VI.RS.02

With the exceptions noted as flags, footnotes, or detailed in the section below; standard operating procedures were followed in the analysis of the samples and no problems were encountered or anomalies observed.

All laboratory quality control samples were within established control limits, with any exceptions noted below, or in the associated QC summary forms.

Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. For diluted samples, the reporting limits are adjusted for the dilution required.

Calculations are performed before rounding to minimize errors in calculated values.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the section below, or in the sample receipt documentation.

Method(s):
TO15 SIM

Sample ID	Client ID	Date Collected	Time Collected	Canister ID	Certification Date	Incoming pressure inHG	Incoming pressure torr	Primary Dilution Factor
N107701	PP03-SG-01-011314	1/13/2014	10:56	6L2543A	12/23/2013	8.4	547	2.20
N107702	PP03-IA-01-011314	1/13/2014	10:57	6L2557A	12/23/2013	2.9	687	1.75
N107703	PP03-AA-01-011314	1/13/2014	11:00	6L2529S	12/23/2013	2.8	689	1.75

DOD
ORGANIC ANALYSES DATA PACKAGE

Analytical Method: TO15 SIM

SDG #: N1077

Lab Name: CH2M HILL ASL

Contract #: N/A

Base/Command: SLOP

Prime Contractor: N/A

Project: St. Louis Ordinance

Field Sample ID	Lab Sample ID
PP03-SG-01-011314	N107701
PP03-IA-01-011314	N107702
PP03-AA-01-011314	N107703

Comments:

SAMPLE DATA SUMMARY

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-SG-01-011314 Lab Sample ID: N107701 Matrix: AIR

% Solids: 0 Sample Description: PP03-SG-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: UG/M3 Dilution: 2.2

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.0114	0.0286	0.0572	0.0286		U
Methylene chloride	0.0311	0.0389	0.0777	0.0495		J
trans-1,2-Dichloroethene	0.0177	0.0444	0.0887	0.0444		U
cis-1,2-Dichloroethene	0.0355	0.0444	0.0887	0.0444		U
Chloroform	0.0219	0.0546	0.109	**1.49**		
1,2-Dichloroethane	0.0181	0.0453	0.0906	0.0453		U
Carbon tetrachloride	0.0282	0.0704	0.141	0.0390		J
Benzene	0.0143	0.0357	0.0715	**0.215**		
Trichloroethene (TCE)	0.0240	0.0601	0.120	0.0440		J
1,1,2-Trichloroethane	0.0244	0.0610	0.122	0.0610		U
Tetrachloroethene (PCE)	0.0304	0.0759	0.152	**1.69**		
1,1,2,2-Tetrachloroethane	0.0307	0.0768	0.154	0.0768		U
Naphthalene	0.117	0.352	0.352	**2.13**		

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-SG-01-011314 Lab Sample ID: N107701 Matrix: AIR

% Solids: 0 Sample Description: PP03-SG-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: UG/M3 Dilution: 2.2

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	102	70-130	
4-Bromofluorobenzene	111	70-130	

Internal Standard	Qualifier
Bromochloromethane	
1,4-Difluorobenzene	
Chlorobenzene-d5	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-IA-01-011314 Lab Sample ID: N107702 Matrix: AIR

% Solids: 0 Sample Description: PP03-IA-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: UG/M3 Dilution: 1.75

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00910	0.0228	0.0455	0.0228		U
Methylene chloride	0.0247	0.0309	0.0618	**0.320**		
trans-1,2-Dichloroethene	0.0141	0.0353	0.0706	0.0353		U
cis-1,2-Dichloroethene	0.0282	0.0353	0.0706	0.0353		U
Chloroform	0.0174	0.0435	0.0869	**2.39**		
1,2-Dichloroethane	0.0144	0.0360	0.0720	**0.0836**		
Carbon tetrachloride	0.0224	0.0560	0.112	**0.449**		
Benzene	0.0114	0.0284	0.0569	**2.04**		
Trichloroethene (TCE)	0.0191	0.0478	0.0956	**0.107**		
1,1,2-Trichloroethane	0.0194	0.0486	0.0971	0.0486		U
Tetrachloroethene (PCE)	0.0241	0.0604	0.121	**0.135**		
1,1,2,2-Tetrachloroethane	0.0244	0.0611	0.122	0.0611		U
Naphthalene	0.0933	0.280	0.280	**0.597**		

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-IA-01-011314 Lab Sample ID: N107702 Matrix: AIR

% Solids: 0 Sample Description: PP03-IA-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: UG/M3 Dilution: 1.75

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	99	70-130	
4-Bromofluorobenzene	106	70-130	

Internal Standard	Qualifier
Bromochloromethane	
1,4-Difluorobenzene	
Chlorobenzene-d5	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-AA-01-011314 Lab Sample ID: N107703 Matrix: AIR

% Solids: 0 Sample Description: PP03-AA-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: UG/M3 Dilution: 1.75

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00910	0.0228	0.0455	0.0228		U
Methylene chloride	0.0247	0.0309	0.0618	**0.286**		
trans-1,2-Dichloroethene	0.0141	0.0353	0.0706	0.0353		U
cis-1,2-Dichloroethene	0.0282	0.0353	0.0706	0.0353		U
Chloroform	0.0174	0.0435	0.0869	**0.165**		
1,2-Dichloroethane	0.0144	0.0360	0.0720	0.0597		J
Carbon tetrachloride	0.0224	0.0560	0.112	**0.326**		
Benzene	0.0114	0.0284	0.0569	**0.936**		
Trichloroethene (TCE)	0.0191	0.0478	0.0956	**0.102**		
1,1,2-Trichloroethane	0.0194	0.0486	0.0971	0.0223		J
Tetrachloroethene (PCE)	0.0241	0.0604	0.121	**0.188**		
1,1,2,2-Tetrachloroethane	0.0244	0.0611	0.122	0.0611		U
Naphthalene	0.0933	0.280	0.280	0.180		J

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-AA-01-011314 Lab Sample ID: N107703 Matrix: AIR

% Solids: 0 Sample Description: PP03-AA-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: UG/M3 Dilution: 1.75

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	99	70-130	
4-Bromofluorobenzene	101	70-130	

Internal Standard	Qualifier
Bromochloromethane	
1,4-Difluorobenzene	
Chlorobenzene-d5	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-SG-01-011314 Lab Sample ID: N107701 Matrix: AIR

% Solids: 0 Sample Description: PP03-SG-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: PPBV Dilution: 2.2

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00440	0.011	0.022	0.011		U
Methylene chloride	0.00880	0.011	0.022	0.014		J
trans-1,2-Dichloroethene	0.00440	0.011	0.022	0.011		U
cis-1,2-Dichloroethene	0.00880	0.011	0.022	0.011		U
Chloroform	0.00440	0.011	0.022	**0.300**		
1,2-Dichloroethane	0.00440	0.011	0.022	0.011		U
Carbon tetrachloride	0.00440	0.011	0.022	0.00610		J
Benzene	0.00440	0.011	0.022	**0.0661**		
Trichloroethene (TCE)	0.00440	0.011	0.022	0.00806		J
1,1,2-Trichloroethane	0.00440	0.011	0.022	0.011		U
Tetrachloroethene (PCE)	0.00440	0.011	0.022	**0.245**		
1,1,2,2-Tetrachloroethane	0.00440	0.011	0.022	0.011		U
Naphthalene	0.022	0.066	0.066	**0.400**		

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-SG-01-011314 Lab Sample ID: N107701 Matrix: AIR

% Solids: 0 Sample Description: PP03-SG-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: PPBV Dilution: 2.2

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	102	70-130	
4-Bromofluorobenzene	111	70-130	

Internal Standard	Qualifier
Bromochloromethane	
1,4-Difluorobenzene	
Chlorobenzene-d5	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-IA-01-011314 Lab Sample ID: N107702 Matrix: AIR

% Solids: 0 Sample Description: PP03-IA-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: PPBV Dilution: 1.75

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00350	0.00875	0.0175	0.00875		U
Methylene chloride	0.007	0.00875	0.0175	**0.0907**		
trans-1,2-Dichloroethene	0.00350	0.00875	0.0175	0.00875		U
cis-1,2-Dichloroethene	0.007	0.00875	0.0175	0.00875		U
Chloroform	0.00350	0.00875	0.0175	**0.481**		
1,2-Dichloroethane	0.00350	0.00875	0.0175	**0.0203**		
Carbon tetrachloride	0.00350	0.00875	0.0175	**0.0702**		
Benzene	0.00350	0.00875	0.0175	**0.628**		
Trichloroethene (TCE)	0.00350	0.00875	0.0175	**0.0195**		
1,1,2-Trichloroethane	0.00350	0.00875	0.0175	0.00875		U
Tetrachloroethene (PCE)	0.00350	0.00875	0.0175	**0.0196**		
1,1,2,2-Tetrachloroethane	0.00350	0.00875	0.0175	0.00875		U
Naphthalene	0.0175	0.0525	0.0525	**0.112**		

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-IA-01-011314 Lab Sample ID: N107702 Matrix: AIR

% Solids: 0 Sample Description: PP03-IA-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: PPBV Dilution: 1.75

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	99	70-130	
4-Bromofluorobenzene	106	70-130	

Internal Standard	Qualifier
Bromochloromethane	
1,4-Difluorobenzene	
Chlorobenzene-d5	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-AA-01-011314 Lab Sample ID: N107703 Matrix: AIR

% Solids: 0 Sample Description: PP03-AA-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: PPBV Dilution: 1.75

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00350	0.00875	0.0175	0.00875		U
Methylene chloride	0.007	0.00875	0.0175	**0.0808**		
trans-1,2-Dichloroethene	0.00350	0.00875	0.0175	0.00875		U
cis-1,2-Dichloroethene	0.007	0.00875	0.0175	0.00875		U
Chloroform	0.00350	0.00875	0.0175	**0.0332**		
1,2-Dichloroethane	0.00350	0.00875	0.0175	0.0145		J
Carbon tetrachloride	0.00350	0.00875	0.0175	**0.051**		
Benzene	0.00350	0.00875	0.0175	**0.288**		
Trichloroethene (TCE)	0.00350	0.00875	0.0175	**0.0186**		
1,1,2-Trichloroethane	0.00350	0.00875	0.0175	0.00402		J
Tetrachloroethene (PCE)	0.00350	0.00875	0.0175	**0.0272**		
1,1,2,2-Tetrachloroethane	0.00350	0.00875	0.0175	0.00875		U
Naphthalene	0.0175	0.0525	0.0525	0.0338		J

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: PP03-AA-01-011314 Lab Sample ID: N107703 Matrix: AIR

% Solids: 0 Sample Description: PP03-AA-01-011314

Date Received: 01/17/14 Date Extracted: Date Analyzed: 02/06/14

Concentration Units: PPBV Dilution: 1.75

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	99	70-130	
4-Bromofluorobenzene	101	70-130	

Internal Standard	Qualifier
Bromochloromethane	
1,4-Difluorobenzene	
Chlorobenzene-d5	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

QC SUMMARY

DOD
ORGANIC ANALYSES DATA SHEET 3 (Part 1)
INITIAL MULTIPOINT CALIBRATION-GC/MS

Analytical Method: TO15 SIM
SDG #: N1077
Lab Name: CH2M HILL ASL
Contract #: N/A
Instrument ID: MSG
Date of Initial Calibration: 02/04/14
Initial Calibration ID: 020414G1
Concentration Units: ppbv
GC Column ID: ZB-624

Initial Calibration Sample IDs:	LEVEL1	LEVEL2	LEVEL3	LEVEL4	LEVEL5	LEVEL6
Initial Calibration File IDs:	LEVEL1.D	LEVEL2.D	LEVEL3.D	LEVEL4.D	LEVEL5.D	LEVEL6.D

Analyte	Std 1	RF 1	Std 2	RF 2	Std 3	RF 3	Std 4	RF 4	Std 5	RF 5	Std 6	RF 6
Bromochloromethane	1	1 000	1	1 000	1	1 000	1	1 000	1	1 000	1	1 000
Vinyl Chloride	004	2 186	01	2 127	02	2 043	05	2 065	25	2 049	5	1 888
Methylene chloride	004	2 984	01	2 780	02	2 754	05	2 491	25	2 400	5	2 170
trans-1,2-Dichloroethene	004	2 997	01	3 033	02	3 295	05	3 239	25	3 250	5	3 141
cis-1,2-Dichloroethene	004	2 395	01	2 384	02	2 456	05	2 533	25	2 571	5	2 758
Chloroform	004	5 003	01	4 770	02	5 047	05	5 070	25	4 890	5	5 145
1,2-Dichloroethane	004	2 846	01	2 938	02	3 492	05	3 335	25	3 244	5	3 383
Carbon tetrachloride	004	2 715	01	2 637	02	3 330	05	3 718	25	3 572	5	3 968
Benzene	02	12 424	05	9 944	25	8 592	5	8 459	2	7 586	5	6 485
1,4-difluorobenzene	1	1 000	1	1 000	1	1 000	1	1 000	1	1 000	1	1 000
Trichloroethene (TCE)	004	0 380	01	0 374	02	0 363	05	0 361	25	0 354	5	0 369
1,1,2-Trichloroethane	004	0 476	01	0 438	02	0 462	05	0 464	25	0 468	5	0 474
Toluene-d8	1	1 159	1	1 140	1	1 176	1	1 184	1	1 195	1	1 171
Tetrachloroethene (PCE)	004	0 525	01	0 508	02	0 538	05	0 530	25	0 509	5	0 515
Chlorobenzene-d5	1	1 000	1	1 000	1	1 000	1	1 000	1	1 000	1	1 000
1,1,2,2-Tetrachloroethane	004	1 357	01	1 397	02	1 384	05	1 378	25	1 326	5	1 365
4-Bromofluorobenzene	1	0 416	1	0 455	1	0 463	1	0 490	1	0 525	1	0 544
Naphthalene	004	1 102	01	1 048	02	0 868	05	0 866	25	0 928	5	1 003

* SPCCs # CCCs

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 3 (Part 1)
INITIAL MULTIPOINT CALIBRATION-GC/MS

Analytical Method: TO15 SIM
SDG #: N1077

Lab Name: CH2M HILL ASL
Contract #: N/A

Instrument ID: MSG
Date of Initial Calibration: 02/04/14

Initial Calibration ID: 020414G1
Concentration Units: ppbv

GC Column ID: ZB-624

Initial Calibration Sample IDs: LEVEL7 LEVEL8

Initial Calibration File IDs: LEVEL7.D LEVEL8.D

Analyte	Std 7	RF 7	Std 8	RF 8	Std 9	RF 9						
Bromochloromethane	1	1 000	1	1 000								
Vinyl Chloride	2	1 701	5	1 582								
Methylene chloride	2	1 833	5	1 612								
trans-1,2-Dichloroethene	2	2 586	5	2 376								
cis-1,2-Dichloroethene	2	2 668	5	2 503								
Chloroform	2	4 578	5	4 067								
1,2-Dichloroethane	2	3 121	5	2 796								
Carbon tetrachloride	2	3 780	5	3 252								
Benzene												
1,4-difluorobenzene	1	1 000	1	1 000								
Trichloroethene (TCE)	2	0 359	5	0 352								
1,1,2-Trichloroethane	2	0 461	5	0 469								
Toluene-d8	1	1 217	1	1 345								
Tetrachloroethene (PCE)	2	0 497	5	0 515								
Chlorobenzene-d5	1	1 000	1	1 000								
1,1,2,2-Tetrachloroethane	2	1 240	5	1 105								
4-Bromofluorobenzene	1	0 534	1	0 538								
Naphthalene	2	0 998	5	1 001								

* SPCCs # CCCs

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 3 (Part 2)
INITIAL MULTIPOINT CALIBRATION-GC/MS

Analytical Method: TO15 SIM

SDG #: N1077

Lab Name: CH2M HILL ASL

Contract #: N/A

Instrument ID: MSG

Date of Initial Calibration: 02/04/14

Initial Calibration ID: 020414G1

Concentration Units: ppbv

GC Column ID: ZB-624

Analyte	Curve Type	Ave. RF	%RSD	r	COD	Q
Bromochloromethane	AVG	1.000	0.00			
Vinyl Chloride	AVG	1.955	10 9			
Methylene chloride	AVG	2.378	20 2			
trans-1,2-Dichloroethene	AVG	2.989	11 2			
cis-1,2-Dichloroethene	AVG	2.533	5.14			
Chloroform	AVG	4.821	7.38			
1,2-Dichloroethane	AVG	3.144	8.30			
Carbon tetrachloride	AVG	3.371	14 5			
Benzene	AVG	8.915	23 2			
1,4-difluorobenzene	AVG	1.000	0.00			
Trichloroethene (TCE)	AVG	0.364	2.63			
1,1,2-Trichloroethane	AVG	0.464	2.54			
Toluene-d8	AVG	1.198	5.30			
Tetrachloroethene (PCE)	AVG	0.517	2.53			
Chlorobenzene-d5	AVG	1.000	0.00			
1,1,2,2-Tetrachloroethane	AVG	1.319	7.55			
4-Bromofluorobenzene	AVG	0.496	9.54			
Naphthalene	AVG	0.977	8.57			

* SPCCs # CCCs

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 4
SECOND SOURCE CALIBRATION VERIFICATION

Analytical Method: TO15 SIM

SDG #: N1077

Lab Name: CH2M HILL ASL

Contract #: N/A

Instrument ID: MSG

Initial Calibration ID: 020414G1

2nd Source ID: ICV-0205

Concentration Units: ppbv

GC Column ID: ZB-624

Analyte	Expected	Found	%D	Q
Vinyl Chloride	0.500	0.487	-3	
Methylene chloride	0.500	0.420	-16	
trans-1,2-Dichloroethene	0.500	0.478	-4	
cis-1,2-Dichloroethene	0.500	0.516	3	
Chloroform	0.500	0.498	-0.4	
1,2-Dichloroethane	0.500	0.502	0.3	
Carbon tetrachloride	0.500	0.569	14	
Benzene	0.500	0.456	-9	
Trichloroethene (TCE)	0.500	0.498	-0.4	
1,1,2-Trichloroethane	0.500	0.502	0.3	
Tetrachloroethene (PCE)	0.500	0.505	1.0	
1,1,2,2-Tetrachloroethane	0.500	0.491	-2	
Naphthalene	0.500	0.489	-2	

* SPCCs # CCCs

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 6
BLANKS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Method Blank ID: XB3-0205 Matrix: AIR

Date Extracted: Date Analyzed: 02/05/14 Instrument: MSG

Dilution: 1 Concentration Units: UG/M3

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00520	0.0130	0.0260	0.0130		U
Methylene chloride	0.0141	0.0177	0.0353	0.0156		J
trans-1,2-Dichloroethene	0.00810	0.0202	0.0403	0.0202		U
cis-1,2-Dichloroethene	0.0161	0.0202	0.0403	0.0202		U
Chloroform	0.00990	0.0248	0.0497	0.0248		U
1,2-Dichloroethane	0.00820	0.0206	0.0412	0.0206		U
Carbon tetrachloride	0.0128	0.0320	0.0640	0.0320		U
Benzene	0.00650	0.0162	0.0325	0.0312		J
Trichloroethene (TCE)	0.0109	0.0273	0.0546	0.0273		U
1,1,2-Trichloroethane	0.0111	0.0277	0.0555	0.0277		U
Tetrachloroethene (PCE)	0.0138	0.0345	0.0690	0.0345		U
1,1,2,2-Tetrachloroethane	0.0140	0.0349	0.0698	0.0349		U
Naphthalene	0.0533	0.160	0.160	0.160		U

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 6
BLANKS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Method Blank ID: XB3-0205 Matrix: AIR

Date Extracted: Date Analyzed: 02/05/14 Instrument: MSG

Dilution: Concentration Units: UG/M3

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	100	70-130	
4-Bromofluorobenzene	78	70-130	

Internal Standard	Qualifier
Bromochloromethane	
1,4-Difluorobenzene	
Chlorobenzene-d5	

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 7
LABORATORY CONTROL SAMPLE

Analytical Method: TO15 SIM

SDG #: N1077

Lab Name: CH2M HILL ASL

Contract #: N/A

LCS ID: BS2X0205

Concentration Units: UG/M3

Instrument ID: MSG

Date Analyzed: 02/05/14

Analyte	Expected	Found	%R	Control Limits	Q
Naphthalene	2.67	2.64	99	70-130	
Vinyl Chloride	1.30	1.53	117	70-130	
Methylene chloride	1.77	1.78	101	70-130	
trans-1,2-Dichloroethene	2.02	2.15	107	70-130	
cis-1,2-Dichloroethene	2.02	2.22	110	70-130	
Chloroform	2.48	2.56	103	70-130	
1,2-Dichloroethane	2.06	2.12	103	70-130	
Carbon tetrachloride	3.20	3.56	111	70-130	
Benzene	1.62	1.49	92	70-130	
Trichloroethene (TCE)	2.73	2.67	98	70-130	
1,1,2-Trichloroethane	2.77	2.81	101	70-130	
Tetrachloroethene (PCE)	3.45	3.39	98	70-130	
1,1,2,2-Tetrachloroethane	3.49	3.48	100	70-130	

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 7
LABORATORY CONTROL SAMPLE

Analytical Method: TO15 SIM

SDG #: N1077

Lab Name: CH2M HILL ASL

Contract #: N/A

LCS ID: BS2X0205

Concentration Units: UG/M3

Instrument ID: MSG

Date Analyzed: 02/05/14

Analyte	Expected	Found	%R	Control Limits	Q

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	100	70-130	
4-Bromofluorobenzene	111	70-130	

Internal Standard	Qualifier
Bromochloromethane	
1,4-Difluorobenzene	
Chlorobenzene-d5	

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 9
HOLDING TIMES

Analytical Method: TO15 SIM SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID	Date Collected	Date Received	1st Date Prepared	Max. Holding Time 1	1st Time Held	2nd Date Prepared	Max. Holding Time 2	2nd Time Held	Date Analyzed	Max. Holding Time A	Time Held Anal.	Q
PP03-SG-01-011314	01/13/14	01/17/14	N/A	N/A	N/A	N/A	N/A	N/A	02/06/14	30	24	
PP03-IA-01-011314	01/13/14	01/17/14	N/A	N/A	N/A	N/A	N/A	N/A	02/06/14	30	24	
PP03-AA-01-011314	01/13/14	01/17/14	N/A	N/A	N/A	N/A	N/A	N/A	02/06/14	30	24	

Comments:

_____

_____

DOD
ORGANIC ANALYSES DATA SHEET 10
INSTRUMENT ANALYSIS SEQUENCE LOG

Analytical Method: TO15 SIM SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Instrument ID: MSG

Field Sample ID/Std ID/ Blank ID/QC Sample ID	Laboratory File ID	Date Analysis Started	Time Analysis Started	Date Analysis Completed	Time Analysis Completed
LEVEL1	LEVEL1.D	02/04/14	1814	02/04/14	1847
LEVEL2	LEVEL2.D	02/04/14	1942	02/04/14	2015
LEVEL3	LEVEL3.D	02/04/14	2027	02/04/14	2100
LEVEL4	LEVEL4.D	02/04/14	2115	02/04/14	2148
LEVEL5	LEVEL5.D	02/04/14	2159	02/04/14	2232
LEVEL6	LEVEL6.D	02/04/14	2244	02/04/14	2317
LEVEL7	LEVEL7.D	02/04/14	2328	02/05/14	0001
LEVEL8	LEVEL8.D	02/05/14	0012	02/05/14	0045

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 10
INSTRUMENT ANALYSIS SEQUENCE LOG

Analytical Method: TO15 SIM SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Instrument ID: MSG

Field Sample ID/Std ID/ Blank ID/QC Sample ID	Laboratory File ID	Date Analysis Started	Time Analysis Started	Date Analysis Completed	Time Analysis Completed
ICV-0205	ICV-0205.D	02/05/14	1632	02/05/14	1705
BS2X0205	BS2X0205.D	02/05/14	1951	02/05/14	2024
XB3-0205	XB3-0205.D	02/05/14	2034	02/05/14	2107
PP03-SG-01-011314	N107701 D	02/06/14	0150	02/06/14	0223
PP03-IA-01-011314	N107702 D	02/06/14	0233	02/06/14	0306
PP03-AA-01-011314	N107703 D	02/06/14	0316	02/06/14	0349

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 11
INSTRUMENT PERFORMANCE CHECK

Analytical Method: TO15 SIM SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Instrument ID: MSG Compound: BFB Injection Date/Time: 02/04/14 1814

Mass	Ion Abundance Criteria	% Relative Abundance		Q
50	15% to 40% of mass 95	0.0		
75	30% to 60% of mass 95	0.0		
95	base peak, 100% relative abundance	100.0		
96	5% to 9% of mass 95	0.0		
173	0% to less than 2% of mass 174	0.0	(0.0)	
174	greater than 50% of mass 95	74.1		
175	5% to 9% of mass 174	0.0	(0.0)	
176	>95%, but <101% of mass 174	71.8	(96.9)	
177	5% to 9% of mass 176	0.0	(0.0)	

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, STANDARDS, BLANKS AND SPIKES:

Field Sample#/Std ID/ Blank ID/QC Sample ID	Lab Sample ID	Date Analyzed	Time Analyzed
LEVEL1	LEVEL1	02/04/14	1814
LEVEL2	LEVEL2	02/04/14	1942
LEVEL3	LEVEL3	02/04/14	2027
LEVEL4	LEVEL4	02/04/14	2115
LEVEL5	LEVEL5	02/04/14	2159
LEVEL6	LEVEL6	02/04/14	2244
LEVEL7	LEVEL7	02/04/14	2328
LEVEL8	LEVEL8	02/05/14	0012

DOD
ORGANIC ANALYSES DATA SHEET 11
INSTRUMENT PERFORMANCE CHECK

Analytical Method: TO15 SIM SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Instrument ID: MSG Compound: BFB Injection Date/Time: 02/05/14 1632

Mass	Ion Abundance Criteria	% Relative Abundance		Q
50	15% to 40% of mass 95	0.0		
75	30% to 60% of mass 95	0.0		
95	base peak, 100% relative abundance	100.0		
96	5% to 9% of mass 95	0.0		
173	0% to less than 2% of mass 174	0.0	(0.0)	
174	greater than 50% of mass 95	74.1		
175	5% to 9% of mass 174	0.0	(0.0)	
176	>95%, but <101% of mass 174	70.6	(95.3)	
177	5% to 9% of mass 176	0.0	(0.0)	

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, STANDARDS, BLANKS AND SPIKES:

Field Sample#/Std ID/ Blank ID/QC Sample ID	Lab Sample ID	Date Analyzed	Time Analyzed
ICV-0205	ICV-0205	02/05/14	1632
BS2X0205	BS2X0205	02/05/14	1951
XB3-0205	XB3-0205	02/05/14	2034
PP03-SG-01-011314	N107701	02/06/14	0150
PP03-IA-01-011314	N107702	02/06/14	0233
PP03-AA-01-011314	N107703	02/06/14	0316

DOD
ORGANIC ANALYSES DATA SHEET APPENDIX A
SURROGATE RESULTS

Analytical Method: TO15 SIM SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Matrix: Air

Field/QC Sample ID	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	Q
BS2X0205	100	111											
XB3-0205	100	78											
PP03-SG-01-011314	102	111											
PP03-IA-01-011314	99	106											
PP03-AA-01-011314	99	101											

S1: Toluene-d8 70-130
S2: 4-Bromofluorobenzene 70-130

Comments:

DOD
ORGANIC ANALYSES DATA SHEET APPENDIX C
INTERNAL STANDARD AREA AND RT SUMMARY

Analytical Method: TO15 SIM SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Instrument ID: MSG Date Analyzed: 02/04/14 Time Analyzed: 2244

	IS1		IS2		IS3	
	AREA (#)	TIME (#)	AREA (#)	TIME (#)	AREA (#)	TIME (#)
MID POINT ICAL	31760	15.08	188008	16.7	152685	20.97
UPPER LIMIT	44464	15.58	263211	17.2	213759	21.47
LOWER LIMIT	19056	14.58	112805	16.2	91611	20.47
SAMPLE ID						
ICV-0205	32869	15.08	196386	16.7	162645	20.97
BS2X0205	27813	15.08	163913	16.70	137790	20.96
XB3-0205	25688	15.13	148347	16.73	116028	20.99
PP03-SG-01-011314	29223	15.08	188786	16.70	162321	20.96
PP03-IA-01-011314	31531	15.07	189265	16.69	161342	20.96
PP03-AA-01-011314	34422	15.06	185633	16.69	151161	20.96

IS1: Bromochloromethane IS4:

IS2: 1,4-Difluorobenzene IS5:

IS3: Chlorobenzene-d5 IS6:

Upper Limit = + 100% of Internal Standard Area
Lower Limit = - 50% of Internal Standard Area

Upper Retention Time Limit = + 0.5 minutes
Lower Retention Time Limit = - 0.5 minutes

Column used to flag values outside of QC limits with an asterisk

Comments:

CH2MHILL
Applied Sciences Laboratory (ASL)

1100 NE Circle Blvd., Suite 300
Corvallis, OR 97330
Tel 541-768-3120 Fax 541-752-0276

DL Study Report

Analytical Method: TO15 SIM
Matrix: Air

Instrument ID: MSG
Concentration Units: PPTV

Analyte	Analysis Date	Amt Spiked	Replicates								Std Dev	DL
			1	2	3	4	5	6	7	8		
Vinyl Chloride	12/02/11	2 00	2 50	2 51	2 51	2 60	2 66	2 68	2 51		0 0783	2 00
Methylene chloride	12/02/11	5 00	6 31	6 78	6 54	9 85	6 98	6 89	6 99	6 63	1 13	4 00
trans-1,2-Dichloroethene	12/02/11	2 00	1 96	1 90	2 16	1 84	1 70	1 98	1 88		0 141	2 00
cis-1,2-Dichloroethene	12/02/11	10 0	11 3	11 5	11 4	11 3	11 5	11 6	8 79	11 3	0 930	4 00
Chloroform	12/02/11	1 00	1 35	1 25	1 21	1 34	1 38	1 22	1 30		0 0673	2 00
1,2-Dichloroethane	12/02/11	1 00	1 22	1 27	1 11	1 14	1 10	1 41	1 10		0 116	2 00
Carbon tetrachloride	12/02/11	1 00	1 22	1 25	1 17	1 48	1 27	1 28	1 13		0 112	2 00
Benzene	12/02/11	1 00	5 85	5 91	5 87	5 84	5 94	5 83	5 90		0 0407	2 00
Trichloroethene (TCE)	12/02/11	1 00	1 32	1 21	1 22	1 40	1 43	1 29	1 55		0 122	2 00
1,1,2-Trichloroethane	12/02/11	2 00	2 18	1 98	2 09	2 03	2 03	2 19	2 11		0 0793	2 00
Tetrachloroethene (PCE)	12/02/11	1 00	1 30	1 26	1 42	1 28	1 23	1 23	1 20		0 0725	2 00
1,1,2,2-Tetrachloroethane	12/02/11	5 00	9 25	9 00	9 10	9 27	9 44	9 48	9 07	9 02	0 186	2 00
Naphthalene	12/02/11	30 0	12 1	10 7	7 58	11 9	8 40	9 24	9 28		1 74	10 0

MDL FORM

EQUIPMENT CERTIFICATIONS

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2529S Lab Sample ID: 6L2529S Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00520	0.0130	0.0260	0.0130		U
Methylene chloride	0.0141	0.0177	0.0353	0.0177		U
trans-1,2-Dichloroethene	0.00810	0.0202	0.0403	0.0202		U
cis-1,2-Dichloroethene	0.0161	0.0202	0.0403	0.0202		U
Chloroform	0.00990	0.0248	0.0497	0.0248		U
1,2-Dichloroethane	0.00820	0.0206	0.0412	0.0206		U
Carbon tetrachloride	0.0128	0.0320	0.0640	0.0320		U
Benzene	0.00650	0.0162	0.0325	0.0162		U
Trichloroethene (TCE)	0.0109	0.0273	0.0546	0.0188		J
1,1,2-Trichloroethane	0.0111	0.0277	0.0555	0.0277		U
Tetrachloroethene (PCE)	0.0138	0.0345	0.0690	0.0201		J
1,1,2,2-Tetrachloroethane	0.0140	0.0349	0.0698	0.0349		U
Naphthalene	0.0533	0.160	0.160	0.160		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2529S Lab Sample ID: 6L2529S Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	99	70-130	
4-Bromofluorobenzene	53	70-130	2 *

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2543A Lab Sample ID: 6L2543A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00520	0.0130	0.0260	0.0130		U
Methylene chloride	0.0141	0.0177	0.0353	0.0177		U
trans-1,2-Dichloroethene	0.00810	0.0202	0.0403	0.0202		U
cis-1,2-Dichloroethene	0.0161	0.0202	0.0403	0.0202		U
Chloroform	0.00990	0.0248	0.0497	0.0248		U
1,2-Dichloroethane	0.00820	0.0206	0.0412	0.0206		U
Carbon tetrachloride	0.0128	0.0320	0.0640	0.0320		U
Benzene	0.00650	0.0162	0.0325	0.0162		U
Trichloroethene (TCE)	0.0109	0.0273	0.0546	0.0273		U
1,1,2-Trichloroethane	0.0111	0.0277	0.0555	0.0277		U
Tetrachloroethene (PCE)	0.0138	0.0345	0.0690	0.0345		U
1,1,2,2-Tetrachloroethane	0.0140	0.0349	0.0698	0.0349		U
Naphthalene	0.0533	0.160	0.160	0.160		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2543A Lab Sample ID: 6L2543A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	99	70-130	
4-Bromofluorobenzene	53	70-130	2 *

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2557A Lab Sample ID: 6L2557A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00520	0.0130	0.0260	0.0130		U
Methylene chloride	0.0141	0.0177	0.0353	0.0177		U
trans-1,2-Dichloroethene	0.00810	0.0202	0.0403	0.0202		U
cis-1,2-Dichloroethene	0.0161	0.0202	0.0403	0.0202		U
Chloroform	0.00990	0.0248	0.0497	0.0248		U
1,2-Dichloroethane	0.00820	0.0206	0.0412	0.0206		U
Carbon tetrachloride	0.0128	0.0320	0.0640	0.0320		U
Benzene	0.00650	0.0162	0.0325	0.0162		U
Trichloroethene (TCE)	0.0109	0.0273	0.0546	0.0164		J
1,1,2-Trichloroethane	0.0111	0.0277	0.0555	0.0277		U
Tetrachloroethene (PCE)	0.0138	0.0345	0.0690	0.0345		U
1,1,2,2-Tetrachloroethane	0.0140	0.0349	0.0698	0.0349		U
Naphthalene	0.0533	0.160	0.160	0.160		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2557A Lab Sample ID: 6L2557A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	101	70-130	
4-Bromofluorobenzene	47	70-130	2 *

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2407A Lab Sample ID: FC2407A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/26/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00520	0.0130	0.0260	0.0130		U
Methylene chloride	0.0141	0.0177	0.0353	0.0177		U
trans-1,2-Dichloroethene	0.00810	0.0202	0.0403	0.0202		U
cis-1,2-Dichloroethene	0.0161	0.0202	0.0403	0.0202		U
Chloroform	0.00990	0.0248	0.0497	0.0248		U
1,2-Dichloroethane	0.00820	0.0206	0.0412	0.0206		U
Carbon tetrachloride	0.0128	0.0320	0.0640	0.0320		U
Benzene	0.00650	0.0162	0.0325	0.0162		U
Trichloroethene (TCE)	0.0109	0.0273	0.0546	0.0273		U
1,1,2-Trichloroethane	0.0111	0.0277	0.0555	0.0277		U
Tetrachloroethene (PCE)	0.0138	0.0345	0.0690	0.0345		U
1,1,2,2-Tetrachloroethane	0.0140	0.0349	0.0698	0.0349		U
Naphthalene	0.0533	0.160	0.160	0.160		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2407A Lab Sample ID: FC2407A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/26/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	95	70-130	
4-Bromofluorobenzene	90	70-130	

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2421A Lab Sample ID: FC2421A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/24/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00520	0.0130	0.0260	0.0130		U
Methylene chloride	0.0141	0.0177	0.0353	0.0177		U
trans-1,2-Dichloroethene	0.00810	0.0202	0.0403	0.0202		U
cis-1,2-Dichloroethene	0.0161	0.0202	0.0403	0.0202		U
Chloroform	0.00990	0.0248	0.0497	0.0248		U
1,2-Dichloroethane	0.00820	0.0206	0.0412	0.0206		U
Carbon tetrachloride	0.0128	0.0320	0.0640	0.0320		U
Benzene	0.00650	0.0162	0.0325	0.0162		U
Trichloroethene (TCE)	0.0109	0.0273	0.0546	0.0273		U
1,1,2-Trichloroethane	0.0111	0.0277	0.0555	0.0277		U
Tetrachloroethene (PCE)	0.0138	0.0345	0.0690	0.0345		U
1,1,2,2-Tetrachloroethane	0.0140	0.0349	0.0698	0.0349		U
Naphthalene	0.0533	0.160	0.160	0.160		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2421A Lab Sample ID: FC2421A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/24/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	98	70-130	
4-Bromofluorobenzene	82	70-130	

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2431A Lab Sample ID: FC2431A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/26/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.00520	0.0130	0.0260	0.0130		U
Methylene chloride	0.0141	0.0177	0.0353	0.0177		U
trans-1,2-Dichloroethene	0.00810	0.0202	0.0403	0.0202		U
cis-1,2-Dichloroethene	0.0161	0.0202	0.0403	0.0202		U
Chloroform	0.00990	0.0248	0.0497	0.0248		U
1,2-Dichloroethane	0.00820	0.0206	0.0412	0.0206		U
Carbon tetrachloride	0.0128	0.0320	0.0640	0.0320		U
Benzene	0.00650	0.0162	0.0325	0.0303		J
Trichloroethene (TCE)	0.0109	0.0273	0.0546	0.0273		U
1,1,2-Trichloroethane	0.0111	0.0277	0.0555	0.0277		U
Tetrachloroethene (PCE)	0.0138	0.0345	0.0690	0.0345		U
1,1,2,2-Tetrachloroethane	0.0140	0.0349	0.0698	0.0349		U
Naphthalene	0.0533	0.160	0.160	0.160		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2431A Lab Sample ID: FC2431A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/26/13

Concentration Units: UG/M3 Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	96	70-130	
4-Bromofluorobenzene	93	70-130	

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2529S Lab Sample ID: 6L2529S Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.002	0.005	0.010	0.005		U
Methylene chloride	0.004	0.005	0.010	0.005		U
trans-1,2-Dichloroethene	0.002	0.005	0.010	0.005		U
cis-1,2-Dichloroethene	0.004	0.005	0.010	0.005		U
Chloroform	0.002	0.005	0.010	0.005		U
1,2-Dichloroethane	0.002	0.005	0.010	0.005		U
Carbon tetrachloride	0.002	0.005	0.010	0.005		U
Benzene	0.002	0.005	0.010	0.005		U
Trichloroethene (TCE)	0.002	0.005	0.010	0.00345		J
1,1,2-Trichloroethane	0.002	0.005	0.010	0.005		U
Tetrachloroethene (PCE)	0.002	0.005	0.010	0.00291		J
1,1,2,2-Tetrachloroethane	0.002	0.005	0.010	0.005		U
Naphthalene	0.010	0.030	0.030	0.030		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2529S Lab Sample ID: 6L2529S Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	99	70-130	
4-Bromofluorobenzene	53	70-130	2 *

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2543A Lab Sample ID: 6L2543A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.002	0.005	0.010	0.005		U
Methylene chloride	0.004	0.005	0.010	0.005		U
trans-1,2-Dichloroethene	0.002	0.005	0.010	0.005		U
cis-1,2-Dichloroethene	0.004	0.005	0.010	0.005		U
Chloroform	0.002	0.005	0.010	0.005		U
1,2-Dichloroethane	0.002	0.005	0.010	0.005		U
Carbon tetrachloride	0.002	0.005	0.010	0.005		U
Benzene	0.002	0.005	0.010	0.005		U
Trichloroethene (TCE)	0.002	0.005	0.010	0.005		U
1,1,2-Trichloroethane	0.002	0.005	0.010	0.005		U
Tetrachloroethene (PCE)	0.002	0.005	0.010	0.005		U
1,1,2,2-Tetrachloroethane	0.002	0.005	0.010	0.005		U
Naphthalene	0.010	0.030	0.030	0.030		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2543A Lab Sample ID: 6L2543A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	99	70-130	
4-Bromofluorobenzene	53	70-130	2 *

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2557A Lab Sample ID: 6L2557A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.002	0.005	0.010	0.005		U
Methylene chloride	0.004	0.005	0.010	0.005		U
trans-1,2-Dichloroethene	0.002	0.005	0.010	0.005		U
cis-1,2-Dichloroethene	0.004	0.005	0.010	0.005		U
Chloroform	0.002	0.005	0.010	0.005		U
1,2-Dichloroethane	0.002	0.005	0.010	0.005		U
Carbon tetrachloride	0.002	0.005	0.010	0.005		U
Benzene	0.002	0.005	0.010	0.005		U
Trichloroethene (TCE)	0.002	0.005	0.010	0.00301		J
1,1,2-Trichloroethane	0.002	0.005	0.010	0.005		U
Tetrachloroethene (PCE)	0.002	0.005	0.010	0.005		U
1,1,2,2-Tetrachloroethane	0.002	0.005	0.010	0.005		U
Naphthalene	0.010	0.030	0.030	0.030		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: 6L2557A Lab Sample ID: 6L2557A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/23/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	101	70-130	
4-Bromofluorobenzene	47	70-130	2 *

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2407A Lab Sample ID: FC2407A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/26/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.002	0.005	0.010	0.005		U
Methylene chloride	0.004	0.005	0.010	0.005		U
trans-1,2-Dichloroethene	0.002	0.005	0.010	0.005		U
cis-1,2-Dichloroethene	0.004	0.005	0.010	0.005		U
Chloroform	0.002	0.005	0.010	0.005		U
1,2-Dichloroethane	0.002	0.005	0.010	0.005		U
Carbon tetrachloride	0.002	0.005	0.010	0.005		U
Benzene	0.002	0.005	0.010	0.005		U
Trichloroethene (TCE)	0.002	0.005	0.010	0.005		U
1,1,2-Trichloroethane	0.002	0.005	0.010	0.005		U
Tetrachloroethene (PCE)	0.002	0.005	0.010	0.005		U
1,1,2,2-Tetrachloroethane	0.002	0.005	0.010	0.005		U
Naphthalene	0.010	0.030	0.030	0.030		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2407A Lab Sample ID: FC2407A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/26/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	95	70-130	
4-Bromofluorobenzene	90	70-130	

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2421A Lab Sample ID: FC2421A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/24/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.002	0.005	0.010	0.005		U
Methylene chloride	0.004	0.005	0.010	0.005		U
trans-1,2-Dichloroethene	0.002	0.005	0.010	0.005		U
cis-1,2-Dichloroethene	0.004	0.005	0.010	0.005		U
Chloroform	0.002	0.005	0.010	0.005		U
1,2-Dichloroethane	0.002	0.005	0.010	0.005		U
Carbon tetrachloride	0.002	0.005	0.010	0.005		U
Benzene	0.002	0.005	0.010	0.005		U
Trichloroethene (TCE)	0.002	0.005	0.010	0.005		U
1,1,2-Trichloroethane	0.002	0.005	0.010	0.005		U
Tetrachloroethene (PCE)	0.002	0.005	0.010	0.005		U
1,1,2,2-Tetrachloroethane	0.002	0.005	0.010	0.005		U
Naphthalene	0.010	0.030	0.030	0.030		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2421A Lab Sample ID: FC2421A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/24/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	98	70-130	
4-Bromofluorobenzene	82	70-130	

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2431A Lab Sample ID: FC2431A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/26/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier
Vinyl Chloride	0.002	0.005	0.010	0.005		U
Methylene chloride	0.004	0.005	0.010	0.005		U
trans-1,2-Dichloroethene	0.002	0.005	0.010	0.005		U
cis-1,2-Dichloroethene	0.004	0.005	0.010	0.005		U
Chloroform	0.002	0.005	0.010	0.005		U
1,2-Dichloroethane	0.002	0.005	0.010	0.005		U
Carbon tetrachloride	0.002	0.005	0.010	0.005		U
Benzene	0.002	0.005	0.010	0.00933		J
Trichloroethene (TCE)	0.002	0.005	0.010	0.005		U
1,1,2-Trichloroethane	0.002	0.005	0.010	0.005		U
Tetrachloroethene (PCE)	0.002	0.005	0.010	0.005		U
1,1,2,2-Tetrachloroethane	0.002	0.005	0.010	0.005		U
Naphthalene	0.010	0.030	0.030	0.030		U

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

DOD
ORGANIC ANALYSES DATA SHEET 2
RESULTS

Analytical Method: TO15 SIM Preparatory Method: NONE SDG #: N1077

Lab Name: CH2M HILL ASL Contract #: N/A

Field Sample ID: FC2431A Lab Sample ID: FC2431A Matrix: AIR

% Solids: 0

Date Received: Date Extracted: Date Analyzed: 12/26/13

Concentration Units: PPBV Dilution: 1

Analyte	DL	LOD	LOQ	Result	Confirm.	Qualifier

Surrogate	Recovery	Control Limits	Qualifier
Toluene-d8	96	70-130	
4-Bromofluorobenzene	93	70-130	

Internal Standard	Qualifier
Bromochloromethane	

Surrogate Recoveries are reported in Appendix O-A
Internal Standards are reported in Appendix O-C

Comments:

CHAIN OF CUSTODY/SHIPPING DOCUMENTS

CH2MHILL
Applied Sciences Laboratory (ASL)

1100 NE Circle Blvd
Suite 300
Corvallis, OR 97330
Tel 541.768.3120
Email: asl@ch2m.com
www.ch2mlab.com

CHAIN OF CUSTODY RECORD

Project # or Purchase Order #
459603.01.VI.RS.01 and 459603.01.VI.RS.02

Company Name
CH2M HILL

Project manager or Contact & Phone #
Tony Swierczek/314.335.3043

Report Copy to:
Shane Lowe

Turnaround Time
☐24 hours ☐48 hours ☐72 hours
☐7 days ☐14 days ☒21 days

Drinking Water? Yes ☐ No ☒

Sample Disposal: Dispose ☒ Return ☐

THIS AREA FOR LAB USE ONLY
N 1077

EPA Tier QC Level
1 (Screening) 2 3 4

Sampling		Type		Matrix				TOTAL # OF CONTAINERS	Requested Analytical Method #									Alternate Description
Date	Time	COMP	GRAB	WATER	SOIL	AIR	CLIENT SAMPLE ID		Benzene, Carbon tetrachloride, Chloroform, 1,2-dichloroethane, cis-1,2-dichloroethene, trans-1,2-dichloroethene, Methylene chloride, Naphthalene, 1,1,2,2-TeCA, 1,1,2-trichloroethane, PCE, TCE, Vinyl chloride									
									Preservative									
									UNPRES									
01/13/14	1056					X	PP03-SG-01-011314	1	X									1
01/13/14	1057					X	PP03-IA-01-011314	1	X									2
01/13/14	1100					X	PP03-AA-01-011314	1	X									3
01/13/14	1225					X	PP02-SG-01-011314	1	X									4
01/13/14	1230					X	PP02-IA-01-011314	1	X									5
01/13/14	1231					X	PP02-IA-01-011314-FD	1	X									6
01/13/14	1233					X	PP02-SG-02-011314	1	X									7
01/13/13	1237					X	PP02-AA-01-011314	1	X									8

Possible Hazard Identification: ☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Volatile Contaminants/Odorous ☐ Biohazard ☐ Other _____

Sampled By and Title — Anthony Swierczek — **Date/Time** 01/14/14 1600

Relinquished By (Please sign and print name) Anthony Swierczek — **Date/Time** 01/14/14 1700

Received By (Please sign and print name) Claudia Hermann Claudia Hermann — **Date/Time** 1/17/14 1200

Relinquished By (Please sign and print name) — **Date/Time**

Received By (Please sign and print name) — **Date/Time**

Shipped Via — **Tracking #**

UPS FedEx Other_____

Special Instructions

tracking # 7976 3812 1003

DOC CONTROL ID: ASL783-0911

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

SDG ID: N1077 Date Received: 1/17/14

Client/Project: St Louis Ordinance Checked By: CT

Packing Material: Ice Blue Ice (Box) Bubble Wrap HD (circle all that apply) Checked By: _____

Shipping ID: _____ -- or -- On File (COC) HD USPS (circle one)

VERIFICATION OF SAMPLE CONDITIONS (verify all items), HD = Client Hand delivered Samples	NA	YES	NO
Were custody seals intact and on the outside of the cooler?		X	
Radiological Screening for DoD	X		
Temp OK? (<6C) Therm ID TH173 Exp. 3/14 2o 3 °C		X	
Was a Chain of Custody (CoC) Provided?		X	
Was the CoC correctly filled out (If No, document in the SRER)		X	
Did sample labels agree with COC? No, document in SRER			X
Did the CoC list a correct bottle count and the preservative types (Y=OK, N=Corrected on CoC)		X	
Were the sample containers in good condition (broken or leaking)?		X	
Was enough sample volume provided for analysis? No, document in SRER	X		
Containers supplied by ASL?		X	

Any sample with < 1/2 holding time remaining? If so contact LPM			X
Samples have multi-phase? If yes, document on SRER			X
All VOCs free of air bubbles? No, document on SRER	X		
pH of all samples met criteria on receipt? If "No", preserve and document below or on SRER	X		
Dissolved/Soluble metals filtered in the field?	X		
Dissolved/Soluble metals have sediment in bottom of container? Document in SRER	X		

Sample ID	Reagent	Reagent Lot Number	Volume Added	Initials

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Exception Report

Sample Batch Number: N1077 **Client/Project** St Louis Ordinance

The following exceptions were noted:

		Comments (write number of exception description and the impacted sample numbers)
	1. No custody seal as required by project	COC split into two SDGs N1077: Samples 1 -> 3 N1085: Samples 4 -> 8
	2. No chain-of-custody provided	COC does not include the equiptment ID
	3. Analysis, description, date of collection not provided	
	4. Samples broken or leaking on receipt.	
	5. Temperature of samples inappropriate for analysis requested	
	6. Container inappropriate for analysis requested	
	7. Inadequate sample volume.	
	8. Preservation inappropriate for analysis requested	
	9. Samples received out of holding time for analysis requested	
	10. Discrepancies between COC form and container labels.	
xx	11. Other.	

ACTION TAKEN:

Originator: Clara Thomann Date: 1/20/2014

Client was notified on: (Date/Time) Client Contact:

Client Services: